Rogers

An Analytical Study of Perception

AN ANALYTICAL STUDY OF PERCEPTION

BY

ANNA SOPHIE ROGERS

A. B. University of Illinois, 1911
A. M. University of Illinois, 1914

THESIS

Submitted in Partial Fulfillment of the Requirements for the

Degree of

DOCTOR OF PHILOSOPHY

IN PSYCHOLOGY

IN

THE GRADUATE SCHOOL

OF THE

UNIVERSITY OF ILLINOIS

1917

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

May 15th 1917

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPERVISION BY ANNA SOPHIE ROGERS

ENTITLED AN ANALYTICAL STUDY OF PERCEPTION

BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Madison Cattell
In Charge of Thesis

Madison Cattell
Head of Department

Recommendation concurred in:*

Christian Albert Ruckmich
Carl Rahn
Jesse Dr. Rhodes
J. R. Kingsley
H. V. Carter

Committee on Final Examination*

*Required for doctor's degree but not for master's.

TABLE OF CONTENTS

CHAPTER I.

INTRODUCTION.

The reflective study of perception has had a long and involved history, -- a history which extends, as we may suppose, far beyond the centuries of written record. For the obvious dependence of existence upon knowledge gained by the senses must have suggested one of the very earliest of all the human problems concerned with mind. The implication of mind, however, in the direct apprehension of present objects has not by any means restricted the study of perception to the psychologist. The philosopher, the logician, the anatomist, the physiologist, and the general student of life, as well as the psychologist, have derived problems from, and erected theories upon, the facts of perception. These facts have had their bearing upon the character, the trustworthiness, and the limitations of knowledge, upon the substance of reality and the nature of truth, upon the construction and the operations of the senses, and upon the mutual relations of the organism and its surroundings.

Our own study is to be limited to the psychological aspects of perception. All of the other aspects we shall leave out of account. And within psychology itself the field of perception is so broad and the problems so diverse that we shall be obliged to propose still further restrictions upon the range of our inquiry. It is principally of the <u>analysis</u> of the perception that we shall treat. We have chosen this part of the whole problem both because analysis has been neglected, even in experimental treatises, and because a description in analytic terms seems to us to be fundamental to any scientific treatment

of mind.

In the following investigation, we shall first approach our subject from the historical side, to distinguish the old from the new and to set our own problems and methods in a just and significant relation to others.

A. The meaning of the term 'perception'.

1. Historical summary.

Until recent times two widely divergent views of perception were current in the history of psychology; two views which show a general correspondence to the ancient dualism of activity and passivity. As applied to mental facts at large, the one side of the dualism conceives of mind as an agent or power, actively manifesting itself in the world; the other side conceives of it either as a product or a reflection of nature, but without dynamic or creative functions. As regards perception, the one view presents a faculty, by which the mind or the soul puts forth its power in the apprehension of surrounding objects; the other view presents a kind of knowledge, mediated by the senses and constructed according to a principle of association or to some law of bodily functions. The two views are to be traced through the long history of reflective thought, the emphasis placed now upon the one side and now upon the other according to the temper of the philosophical, theological, and scientific theories of the time.

The first way of treating the problems of perception has been common since the time of Plato; the second attained its greatest prominence in the eighteenth century through the development of the doctrine of "sensationalism".

Plato[1] and Aristotle[2] are among the earliest of western philosophers to consider perception as a faculty whence the mind or soul derived its knowledge of the physical world. The outside world has somehow to be made known to man and the means of knowledge resolved itself into a passage of impressions through the senses. The impressions once received were organized by the soul (Plato) or the common sense (Aristotle).

The Platonic and Aristolelian view of perception was destined to exert a strong influence for many centuries. Restatements of the doctrine are to be found in Descartes, in Locke, and in Leibniz. In the system of Descartes,[3] perception is called a "function", but "function" is only the older "faculty" in disguise. And as with Plato, so with Descartes the soul is the unifying agent for the various impressions of sense. Leibniz[4] likewise adheres to an interpretation of the soul in terms of faculties. The entire universe is composed of dynamic monads, which are ordered from the lowest to the highest according to their ability to perceive. In the human being the monad or soul becomes the bond of union. This conception of an unification of all activities by the single monad is strongly reminiscent of Plato and Aristotle. Perception is conceived as one of the activities of the monad. The individual perceptions vary as to clearness, some being obscure and others

---

1. Plato, Theaetetus (Ed. I. Burnet, Oxford ed.), Sec. 151-152; Republic (Ed. Stallbaum), V, xxi, VII, vii.
2. Aristotle, De anima (Ed. F. A. Trendelenburg), II, iii-xii, III, i-ii.
3. Descartes, R., The passions (Ed. C. Adam and P. Tannery), Sec. xvii, xix-xxxv.
4. Leibniz, G. W., Monadology, 1714, Sec. 14, 19, 21.

clear. If a monad cannot distinguish between two objects or between itself and the objects, then the perception is obscure. If, on the other hand, the monad distinguishes between objects, and apprehends itself as different from objects, then it has the power of clear perception and is regarded as a soul. Like Descartes and Leibniz, Locke[5] regards perception as an activity or power. He maintains that it is the primary faculty for receiving knowledge about the physical world. Not every impression upon the sense organ, however, gives rise to a perception. Whether or not it does depends upon the frequency of its occurrence, and also upon the mind's preöccupation with other ideas. For Locke, however, perception is more than a faculty or power; it is the material of knowledge. Through the medium of sensations the organism perceives objects as possessing the primary qualities of extension, motion, number, and figure, and the secondary qualities of sound, color, and the like.

By all these writers, then, perception has been regarded as a capacity, power, or faculty of mind, with the qualification that in Locke, although defined as a faculty, it is also regarded as a kind of knowledge originating in "sensation". After Locke the notion that perception results from the combination of sense impressions received elaborate exposition at the hands of the "associationists". Hume expressed the doctrine when he said concerning perceptions of space and of time that "there is another very decisive argu-

---

5. Locke, J., Essay concerning human understanding, London, 1823, Bk. I; Bk. II, chap. 9.

ment, which establishes the present doctrine concerning our ideas of space and time, and is founded only on that simple principle, that our ideas of them are compounded of parts which are indivisible."[6]

Much later, Bain[7] includes muscular feelings as well as sensory impressions in the materials of perception. Moreover, perception is, according to Bain, a more highly intellectual process than sensation. The criterion which determines whether a process is intellectual or sensory is discrimination, or the feeling of a difference. The fundamental fact of perception, namely that it is the result of association, signifies that several constituents are present and are accompanied by a feeling of difference between the successive or coexisting impressions. Bain anticipates James in this distinction between perception and sensation, making the difference one of kind and degree of knowledge. James maintains that perceptions and sensations resemble each other, but are not identical. Perception differs from sensation in that it implies "consciousness of farther facts associated with the object of sensation."[8]

The principle of associationism was adopted by the French psychologists, Condillac and Bonnet. Condillac worked out an elaborate system of sensationalism. Every capacity of

---

6. Hume, D., A treatise of human nature, 1748, II, iii.
7. Bain, A., The senses and the intellect, N. Y., 1874, 364; The emotions and the will, N. Y., 1876, 549.
8. James, W., The principles of psychology, N. Y., 1890, II, 77.

the soul is derived from sensations, between which are established associative connections.[9] He anticipates Herbart's mechanics of ideas in assuming that some impressions and presentations are favored by desire and attention, while others are kept in the background. Like Condillac, Bonnet derived all mental life from sense impressions, but instead of resulting from the association of sensations, everything was to be interpreted in terms of nervous mechanisms. The description of mind becomes a "nerve-fibre psychology".[10] Perception originates from the simultaneous and successive excitations, which give rise to sympathetic movement in connected or contiguous fibers.

In German psychology of the eighteenth century, accounts of perception were given both in terms of faculty, as expounded by the philosopher Christian Wolff, and in terms of the sensationalism of England and France. Later, in Herbart,[11] perception, like all other mental phenomena, was reduced to the single, primary act of presentation (Vorstellen). It was the result of fusions and complications. Herbart's emphasis upon the fluid and the dynamic aspects of mind has exerted a strong influence in the subsequent scientific period. But it is principally Wundt's insistence upon mental analysis in terms of process that has given us the doctrine of perception as a typical mental formation whose members are the simple processes of sensation and feeling.

---

9. Dessoir, M., Abriss einer Geschichte der Psychologie. Heidelberg, 1911, 114.
10. Klemm, O., Geschichte der Psychologie, Leipzig, 1911, 98.
11. Herbart, J. F., Lehrbuch zur Psychologie, 1834, Sec. 55-56.

2. Current uses.

As in earlier times so also during the scientific period the word 'perception' has been put to two unlike uses, -- uses which are similar to, but not identical with, the older dualism. First, it is treated as one of the major functions of the mind, after the pattern of the active powers or "faculties", and secondly, it is more passively regarded as a composite of individual processes. Functionally treated, perception becomes a performance, an accomplishment, or the discharge of a service;[12] more passively and descriptively regarded, it is an organic whole, analyzable into component parts. On the side of function, the perceptual performance may be purely mental, as knowledge of environment, cognition of the world, or it may be a psychophysical function which the whole organism expresses in overt or inhibited action. The first is the cognitive, the second the biological function of perception.

Among the writers interpreting perception as a composite of elementary processes, are to be found Wundt, Titchener, Angell, James, Binet. Perception thus considered is organized; i. e., its constituents are arranged in definite configurations and patterns. The exact nature of these constituents varies from author to author, but there is a general agreement as regards sensational and imaginal processes, both of which vary from individual to individual and from perception to perception. Not

---

12. Ruckmich, C. A., The uses of the term function in English textbooks of psychology, Amer. J. of Psychol., 1913, xxiv, 99; Dallenbach, K. M., The history and derivation of the word 'function' as a systematic term in psychology, ibid., 1915, xxvi, 473.

only do images arise with sensations to form perceptions, but affections are, according to Wundt,[13] also regarded as constant, component parts. This affective component is less regarded in perception by Titchener, Angell, and James. A "pure" perception would be composed of sensations alone, but this seldom exists. There are usually imaginal accompaniments, the kind depending both upon individual constitution and upon the previous setting of similar experiences.

Again, there are other writers who propose another kind of constituent for the perceptual complex, a formal or 'funded' quality.[14] Over and above the sensational and imaginal processes, these writers profess to find something which determines the perceptual complex and which is 'subjectively' added. The chief exponents of this theory have belonged to the Austrian school. Among them are Ehrenfels, Meinong, Cornelius, and Witasek. The real value of their contention lies, not in the discovery of new and unique members or factors in the perceptual complex, but upon the fact -- overlooked by traditional sensationalism -- that the perception has characteristics, properties, and functions which distinguish it and which disappear when the complex undergoes analysis.

Where perception is thus regarded process-wise as a group of integrated and organized members, it is obvious that its cognitive aspect, - its meaning, - has separately to be considered. The relation of process to meaning in perception has been

---

13. Wundt, W., Grundzüge der physiologischen Psychologie, Leipzig, 1911, III (6th ed.), 296.
14. Bentley, M., The psychology of mental arrangement, Amer. J.of Psychol., 1902, xiii, 269.

variously conceived. Some writers agree in regarding images as the most important factor for giving purport to the complex. According to the Wundtian doctrine of 'context', as expounded by Titchener,[15] it is the background which may be either imaginal or sensational, which gives significance to the perception.

When regarded functionally, perception wears a different aspect and it provokes a different kind of scientific enquiry. Let us consider it first as a mental function and afterward as a psychophysical function. The first kind finds an exponent in Stout, who describes perception as "essentially cognition".[16] He means that the mind acquires knowledge of objects by means of a cognitive performance. Stout has been influenced by James: but James was interested in the biological or psychophysical as well as in the cognitive functions of perception,[17] according to which the response of the organism or the motor discharge forms part of the perception as essential as the afferent impulse. Such a view is sustained, e.g., by Dewey, who, in opposition to Stout, defines perception as primarily a fact of action, not one of cognition.[18] The perceived objects are arranged about our bodies as centers and our field of perception increases and varies with the growth and needs of the organism. From action to adjustment is a short step, and it has become common for writers whose main interest lies on the biological side to affirm that the adaptation of the organism to its surroundings is the primary function of per-

---

15. Titchener, E.B., A textbook of psychology, N. Y., 1915, 367. Cf. Angell, J. R., Psychology, N. Y., 1908, 156.
16. Stout, G. F., A Manual of psychology, N.Y., 1899, 241.
17. James, W., The principles of psychology, 1890, II, chap. xix.
18. Dewey, J., Perception and organic action, J. of Philos., Psychol., Etc., 1912, ix, 645.

ception.[19]

Perception finds a place as a mental function likewise in systems of comparative and genetic psychology and of behaviorism. Watson, who stands for behaviorism as a substitute for psychology, speaks constantly of the "sense functions", which really include perception, as shown by some of the problems suggested under such headings; e.g., "the role of vision in daily life", and "the response to ordinary sounds in the animal's environment".[20] Baldwin,[21] too, in his statement of genetic problems, emphasizes the fact of "functional epochs", or the child's acquisition of knowledge through direct experience.

We may, then, summarize our historical survey by remarking upon the persistence through many centuries of the 'active' and 'passive' views of perception. Until recent, more scientific times, perception was either a power, a faculty, of the soul or the mere reception of "impressions" to be connected and elaborated by "association" or by the nervous system. Under the conjoint influence of the other sciences and of experiment within psychology itself, the dualism of active and passive has been softened, but it still persists in the functional and analytical accounts of perception. The one looks upon perception as a mental or psychophysical performance, of use either to the organism or to knowledge; the other describes it in terms of integrated processes.

---

19. Judd, C.H., What is perception?, J. of Philos., Psychol., Etc., 1909, vi, 36; Aaronson, I., Perception, ibid, 1914, xi, 37.
20. Watson, J. B., Behavior, N.Y., 1914, 33-36.
21. Baldwin, J. M., Mental development, N. Y., 1895, 1ff.

With these gross distinctions, historical and current, in view, we turn now to an inspection of the actual problems and methods which are to be found in the recent literature of our subject. This inspection will be a useful means to orientation within the field of our own experimental studies.

B. A survey of perception in modern psychology.

1. Kinds and classes.

In order to discover an adequate basis of classification, let us review the treatment accorded our subject by such systematic psychologists as Wundt, Külpe, Titchener, Angell, Pillsbury, Stout, and Ebbinghaus. Consonant with our historical summary, we find, in these systems, that perceptions are classified either as (a) modes of integration of component processes or (b) according to the kinds of knowledge which they mediate.

(a) Classification of perception as modes of integration.

Wundt is one of the chief exponents of a distinction made in terms of the manner of combination of the elementary processes. Perceptions are, for him, fusions, complications, and assimilations.[22] An association of elements by fusion may be intensive or extensive. By intensive fusion he means that interconnection which exists between processes by virtue of their qualitative relationships; e.g., the clang. This kind of affinity between mental processes exists only among those arising from the same sense-department and from sensory stimulation. The term 'fusion' is extended to other forms, spatial and temporal, where it is designated as extensive. If the perception, on the other hand, arises from a union of sensations from different sense-departments, as a

---

22. Op. cit., 500 ff.

perception of water from visual and cutaneous processes, then it is known as a complication. These two modes of integration account for perceptions that are composed of only present experiences. There are, however, other perceptual complexes, in which reproduced experiences play an important part, as the perception of any familiar object which contains more than the bare sensory processes. Whenever image combines with sensation to form a perception, the integration in known as an assimilation.

Külpe and Titchener also classify perceptions according to the mode of integration of the component factors. The modes of perceptual integration according to Külpe differ but slightly from those of Wundt. Külpe's classification includes fusion, colligation, and association.[23] Fusion is defined as a qualitative connection between elements when they are spatially and temporally identical; e.g., if two notes are simultaneously given, the tones would be temporally identical, but qualitatively diverse. Fusion, then, from Külpe's point of view is only one (the intensive) phase of Wundt's fusion. The spatial and temporal perceptions are designated by Külpe as colligations. For example,the tone, a',repeated with alternately long and short intervals, would be an instance of identical quality, but of different temporal relations, and it would fall accordingly into a temporal colligation rhythm. A pattern of colors would illustrate the spatial kind of colligation. Furthermore, elements not only unite qualitatively, spatially, and temporally, but they integrate also because each tends to establish a relationship between itself and other processes. So arise

---

23. Külpe, O., Grundriss der Psychologie, Leipzig, 1893, 284 ff.

associative combinations.

According to Titchener, perceptions are distinguished as qualitative, spatial, temporal, and mixed.[24] The first three would all be grouped as fusions, intensive and extensive, by Wundt, while Titchener's mixed type is virtually equivalent to Wundt's assimilation. But Titchener's qualitative perceptions include Wundt's complications.

In general then, with slight limitations and expansions of terminology, Wundt, Külpe, and Titchener make similar classification of perceptions. Their distinctions between kinds or types depend mainly upon the capacity of the sensory processes to integrate qualitatively, spatially, or temporally, or upon the fact of images attaching themselves to sensations to form perceptions.

(b) Classification of perceptions based upon kind of knowledge.

A classification of perception from this point of view depends upon an interpretation of it from its functional aspect. Stout, Angell, Pillsbury, and Ebbinghaus treat it in this manner. Stout enumerates five kinds: perception of external or physical reality of space, time, causality, and 'thinghood'.[25] A glance at these terms will disclose the emphasis placed upon the cognitive function. In order to have any perception at all there must be some external or physical object, even the body or its parts becoming external to the self when cognized. Besides being external, every object must possess unity, identity, and independence

---

24. Op. cit., 389.
25. Op. cit., 312.

by virtue of which it is perceived as distinct from every other object. This distinctness is designated 'thinghood'. Furthermore, an object, besides being external to the organism and distinct from every other object, may also be thought of as causality, or as the result of a gradual, practical adaptation, whereby, through past experiences, the organism becomes aware of the object's efficiency or inefficiency. In all of these categories of perception, the importance of knowledge or information about objects is the outstanding factor. Likewise, perceptions of space are such as have to do with information about some physical object, for space is a matter of relations in position and distance, and position and distance must pertain to objects. What is true of spatial perceptions is also true of temporal; i.e., time bears relation to something, to the past, present and future.

Like Stout, Angell, Pillsbury, and Ebbinghaus draw distinctions between the large classes of perception according to the kind of knowledge derived. Angell, however, limits all perceptions to two main classes, spatial and temporal. Every perceived object implies a spatial and a temporal order. Each class has its own peculiar function: by means of spatial perceptions the organism becomes accommodated to a three-dimensional world; by means of temporal perceptions, to a "world of sequential events".[26] Thus, by virtue of knowledge concerning the outside world acquired through the perceptual functions the living being adjusts itself to its environment.

---

26. Angell, J. R., Psychology, N. Y., 1908, 172.

Pillsbury does not vary much from Angell's position. The chief concern is, he says, the tracing of "factors that aid in the transformation of the sensations into objects."[27] During this procedure, it is also necessary to keep in mind the way in which "elementary mental states come to mean that which they are not." For him, the meanings, or informations, are of much more importance than the formation or integration of the perception. The kinds of meanings, or knowledge, which are obtained by way of the perceptual process are fusions, and spatial and temporal relations. Besides these, the mind may also become aware of movement, or change, and of rhythm. The former is related both to space and time, the latter primarily to time. We see, then, that these types of perception are not very different from those of Angell and Stout. They stand related to those of the former in that fusion, movement, and rhythm are perceived as parts of a spatial and temporal order; to those of the latter by virtue of the fact that in so far as adjustment and reaction to objects aid greatly in the perception of them, objects as perceived, whether as fusions, movement, or rhythm, must possess physical reality, causality, and 'thinghood'.

Finally, the classification of Ebbinghaus, although it appears to be of the first or integrative kind, is at bottom functional. The general (gemeinsame) or formal attributes, unity, identity, plurality, difference, and the like,[28] which Ebbinghaus assigns to sensations are really functional marks, so that his account of perception is really not at all a description of mental processes but a description of the kinds of knowledge to which

---

27. Pillsbury, W.B., The fundamentals of psychology, N.Y., 1916, 269.
28. Ebbinghaus, H., Grundzüge der Psychologie, Leipzig, 1911, I, 442.

perceptions give rise. Ebbinghaus has therefore to be grouped with Stout, Pillsbury, and Angell, rather than with Wundt, Külpe and Titchener.

In general, then, it may be said that the psychologists who base their classification of perception upon kind of knowledge derived are emphasizing the functional aspect. Furthermore, this division of the types of perceptions may be as various, with respect to terminology, as the relationships of object to object and of object to organism may suggest. On the other hand, those who have distinguished classes of perception upon the basis of integration have placed the main emphasis upon the fact that perception is an organized complex made up of elementary processes.

The recent insistence upon the adaptive functions of mind leads the student of perception to look for a third kind of classification which should take into account the facts of organic adjustment. Systematic work of this kind seems, however, not to have been done. Where general terms have been demanded by the biologising psychologist, the older, cognitive distinctions seem to have been transferred to the ecological kind of function.

2. Problems of perception.[29]

With this historical background in mind, let us turn now to the empirical problems which the subject of perception has presented, and then proceed to the methods employed for their solution. The problems may be grouped under the following eight headings:

1. Dependence of perception upon variations of stimulus as to its (a) kind, (b) temporal peculiarites, (c) spatial arrangement, and (d) degree: perception is either (1') analyzed in terms of process or (2') referred in terms of meaning to variations in stimulus.

2. Dependence of perception upon organic conditions: (a) general, and (b) local.

3. Dependence of perception upon the general state or condition of mind.

4. Relation of perception to organic movement.

5. Deranged perceptions: synaesthesias, illusions, hallucinations.

6. Relation of perception to thought.

---

29. For a basis of determination of the problems and methods of perception, approximately 150 investigations were examined. For this purpose the studies upon perception, reported in the following periodicals, were scrutinized: Amer. J. of Psychol., 1903, xiv, --1916, xxvii; J. of Animal Behav., 1911, i,--1916, vi; J. of Philos., Psychol., Etc., 1910, vii,--1916, xiii; Psychol. Rev., 1908, xv, --1916, xxiii; Brit. J. of Psychol., 1904-05, I --1915-16, viii,Pts. 1, 2, 3; L'Annee Psychol., 1910,xvi, --1914, xx; Arch. f. d. ges. Psychol., 1909, xiv --1915, xxxiv, Psychol. Stud., 1905-06, i,-- 1907, iii, 1911-12, vii,-1913-14, ix; Psychol. Index, 1915, xxii (All references quoted upon perception); and many other volumes and periodicals not here quoted.

7. Nature of perception in animals.

8. Development of perception: (a) phylogenetic, and (b) ontogenetic.

An examination of the recent experimental literature will serve both to define and to illustrate the numerous perceptual problems which have already been formulated. We shall take them in order.

1. Dependence of perception upon stimulus.

The problems of perception which depend upon the control of the stimulus present many and various phases, since the stimulus may be widely varied with respect to its various characteristics. The task then resolves itself into (1') the analytical description of the sensational and imaginal processes making up the perception under variations of stimulus, or (2') the correlation of change in meaning with change in stimulus. Either of these modes of interpretation of results may be the aim of the investigation underany of the four possibilities of modification which have been distinguished.

(a) Dependence of perception upon change in kind of stimulus. Under this sort of quest, the three remaining aspects of stimulus, time, arrangement, and degree, are kept as constant as possible, while modifications in kind are made under control, in order to determine any difference in the perception which may result. The investigation by Kemp[30] upon tonal fusion furnishes an excellent example of this part of the first problem. Two notes, of unlike vibration rates, were presented to the observers, who were instructed to compare the tonal complexes as regards

---

30. Kemp, W., Methodisches und Experimentelles zur Lehre von der Tonverschmelzung, Arch. f. d. ges. Psychol., 1913, xxix, 139.

degree of fusion.

Experiments in which merely changes in meaning are reported, and in which the aim is to refer these changes to modifications in the character of the stimulus are illustrated by Woodrow's[31] study of rhythm. The influence of the intensive and temporal factors was minimized or eliminated, thus producing the most favorable conditions possible for correlations between qualitative changes in perception and variations in the nature of the stimulus.

(b) Dependence of perception upon the temporal properties of the stimulus. Perceptions of rhythm and intervals of time are directly influenced by any temporal modifications in the stimulus. Experiments which illustrate this were devised by Ross[32] and Wallin.[33] In the first investigation, a series of ten clicks, all at constant intervals with one exception, wherein the time was shortened, was provided. The task of the observer was to detect the exceptional interval. The perception of this particular duration was described only by its detection, when compared with another constant time; i.e., it was described only in terms of meaning, not of process.

On the other hand, Wallin determined not only changes in meaning, but also the processes which underlie the perception.

---

31. Woodrow, H., Rôle of pitch in rhythm, Psychol. Rev., 1911, xviii, 54.
32. Ross, F. B., The measurement of time-sense as an element in the sense of rhythm, Psychol. Monog., 1914, xvi (No.69),166.
33. Wallin, J. E.W., Experimental studies of rhythm and time, Psychol. Rev., 1912, xix, 271.

The observers were asked to find a tempo midway between two others, one fast and one slow. With the quantitative results were also recorded comments made by the observers upon the aids employed in the perception and the determination of the temporal rate. Wallin reports, e.g., that "four believed that they based their estimations on the immediate impressions", "practically all the subjects made use of the kinaesthetic factors", or again, "only three were conscious of using any visual imagery".[34] Although these comments are not true introspections made in terms of process, they show more of a tendency in that direction than the reports of the observers in Ross' experiment.

(c) Dependence of perception upon the spatial arrangement of stimulus. The possibilities of modifications in the spatial pattern of stimulus are illustrated in many investigations into those perceptions which owe their configurations and meanings primarily to the spatial arrangement of the exciting agency; e.g., perceptions of lines, depth, size, and form. Such an experiment as Miss Cook carried out upon the cutaneous estimation of filled and unfilled space, is a case in point. Aesthesiometers for punctal and continuous impressions were used.[35] The problem was to determine the amount of illusion present in the comparison of filled and unfilled spaces, which assumes a change of perception corresponding to a change in the spatial relationships of the stimulus.

---

34. Ibid., 295.
35. Cook, Helen D., Die taktile Schätzung von ausgefüllten und leeren Strecken, Arch. f. d. ges. Psychol., 1909-10, xvi, 442.

We find, however, other investigators describing the perception both as meaning and as process. In an experiment upon reversible drawings,[36] Becher, e.g., has discovered not only that different meanings arise under spatial differences of stimulus but also he has identified the mental processes which correspond to these differences.

(d) Dependence of perception upon the degree of stimulus. An investigation was conducted by Arps and Klemm[37] for the purpose of determining this dependence in the localization of sound. The source of the sound was a tuning fork, which could be moved in either the median or transverse plane of the head. The sound itself was transmitted to the observer by means of a telephonic connection. The observer's task was to compare one sound with another of like intensity but in a different position, or with a sound at the same distance as the first, but of unequal intensity. Since the duration and quality of the sound were constant, its intensity was the determining factor for localization. The problem of these two investigators was that of the second or cognitive type, since it was concerned with spatial localization.

2. Dependence of perception upon organic conditions: (a) general, and (b) local.

(a) The perception of an object may be greatly influenced by the general state of the organism. For example, one experimenter, Jones,[38] permitted himself to be anesthetized with

---

36. Becher, E., Uber umkehrbare Zeichnungen, Arch. f. d. ges. Psychol., 1909-10, xvi, 397.
37. Arps, G.F. & Klemm,O., Untersuchungen über die Lokalisation von Schallreizen, Psychol. Stud., 1912-13, viii, 226.
38. Jones, F.E., The waning of consciousness under chloroform, Psychol. Rev., 1909, xvi,48.

chloroform in order that he might introspectively observe the effect upon his mental processes. He found not only that perceptions were the first mental processes to drop out, but that these also changed as they disappeared. For instance, he says that "all movements made appeared to be much longer than they actually were", that "winking gave the peculiar feeling of a great curtain slowly shutting out the light and as slowly rolling back again", and numerous other instances of perceptions which were modified by the anesthetized condition.

(b) Every perception depends upon the condition of its particular sense organ, consequently modifications of local organic conditions result in modifications of the mental correlates. Perceptions which indicate directly such an influence are the difference in the perception of size by different parts of the retina, the perception of the position of objects with the head held at various angles, and the different perceptions of the same pattern upon various parts of the skin. The first depends upon the local conditions of the retina; the second, upon organic conditions within the head; the third, upon the distribution and 'local sign' of the pressure organs in various parts of the skin. For illustration, we may cite Stevens' experiment upon Peculiarities of Peripheral Vision.[39] By one of the psychophysical methods, the author determined the perceived difference in the size of the objects at different parts of the retina.

---

39. Stevens, H. C., Peculiarities of peripheral vision, Psychol. Rev., 1908, xv, 69.

3. Dependence of perception upon the general state or condition of mind.

States of this sort are attention, expectation, doubt, hesitation, and deliberation. The subject is so predisposed when stimulus is applied as to affect the perception. In reporting an experiment upon the influence of expectation upon auditory localization, Geissler says[40] "in our method the greatest importance must be laid on the instructions given to the observers and the subsequent reports demanded from them". In other words, he had previously prepared his subjects to perceive the object in a certain position, and his task was to determine in how far this mental set affected the perception.

4. Relation of perception to organic movements.

In the three groups just reviewed, the task of the investigator ended when he had established and described a perceptual complex under certain conditions; but in the fourth group emphasis is placed less upon sensory and imaginal components of the perceptual consciousness than upon resultant and motor tendencies which are sometimes alleged to be factors essential to perception.[41] The following quotation from Judd, who writes in terms of "reaction" and "adjustment", will make the matter clear. "The simplest perception of an object which is presented to the eyes contains a great deal more than the sensory elements of which

---

40. Geissler, L. R., Sound localization under determined expectation, Amer. J. of Psychol., 1915, xxvi, 269.
41. J.Dewey (op. cit.) maintains that perception is the result of incipient and partial organic responses.

it is composed. It consists of certain forms of arrangement and certain tendencies toward reaction which must be recognized by any student who would work out an adequate account of these processes."[42] Partial or total "adjustments" are then, for Judd, necessary factors in perception.

From what has just been said concerning the relation of perception to organic movement, it is evident that such writers as Judd are less concerned with the perception itself than with events and occurrences concomitant with or subsequent to the perceptual complex, with events which are really the final result and not the components of perception. The chief interest in perception, from this point of view, is a consideration of it as the accommodation of the organism to its surroundings.

5. Deranged perceptions: synaesthesias, illusions, hallucinations. Some of the problems developing from the study of deranged perceptions are; (a) a description of the processes which comprise the complex; (b) a description of meanings; and (c) an explanation of the cause of such perceptions. This last problem belongs primarily under the second group of problems, or the dependence of perception upon organic condition. A description of a deranged perception in terms of process is difficult, because of the inability and the limited reliability of introspective reports under conditions where such derangements occur. But referring again to the experiment by Jones,[43] upon the influence of anaesthetics, we find from his own observations that the distorted perceptions are the result of disturbed sensory

---

42. Judd, C. H., op. cit., 40.
43. Jones, E. E., op. cit., 51.

processes; e. g., he reported that, at first, the visual sensations were clearer and more intensive, while auditory and tactual processes decreased in clearness, and his deranged perception of movement was the probable sequence of the low intensity of tactual sensations.

6. Relation of perception to thought.

If perception bears any relation to thought, the relation must be sought on the side of common properties either of process or of function. With regard to composition, we might expect to find like components and even similarities of integration. Thought might then be simply resolved into a greater elaboration of meaning than perception, due to its greater complexity of composition and differences of function of the component processes. Thought would, from this point of view, be distinguished from perception by degree of meaning rather than as a different kind of mental phenomenon. On the side of function, common attributes and properties of the two activities must be taken into account. If perception is considered as cognitive, and thought as elaborative, then there is a wide distinction; but if we look upon perception as accomplishing something more than mere apprehension, then we find that the two functions again approach each other in nature. The problem, however, has never received comprehensive treatment.[44]

7. The nature of perception in animals.

Here we find two main problems; first, a description of the mind or organisms below man based upon a comparison with the

---

44. F. Aveling (Relation of thought-process and percept, Brit. J. of Psychol., 1911, iv, 213) considers the interrelations of thought and the sensational processes as the problems which underlie the relation of thought and perception.

human mind, and secondly, the relation of animal performances to perception. An experiment by Johnson[45] will illustrate the first. Monkeys and chicks were made to discriminate lines or striae of different widths. Limens of discrimination were found not only for these animals, but also for man and, by comparison, the investigator arrived at a description of perception in these animals. Other psychologists, however, who are interested in the animal mind do not lay so much stress upon the analysis of perception as a complex. A description of perception as a performance, a behavior, or a response, and the direct correlation of this to stimulus, suffices for their interpretations and purposes. Among others, we find Watson[46] taking this extreme view. This kind of problem, we see, is entirely different from that of perception.

8. Development of perception: (a) phylogenetic and (b) ontogenetic.

The first group of problems, listed here, presents a large field and a wide range. The investigator who enters upon such a task as determining the development of perception in the animal phyla must possess much ingenuity and versatility in pursuing the many problems which present themselves and in devising methods for their solution. Here would be listed such problems as the modification of perceptual complexes from the lowest to the highest living form, a comparison of differences in perception with differences of nervous system, and a comparison of perception with other

---

45. Johnson, H. M., Effective differences in width of visible striae for the monkey and the chick, J. of Animal Behav., 1916, vi, 169.
46. Watson, J. B., op.cit; others, as Pillsbury (op.cit., 14) do not take such an extreme position.

mental complexes at the various stages of development in the animal series. The ontogenetic development of perception, on the other hand, does not include such a wide scope, but limits itself to the study of perception within one organism from birth to death. The description of perception in its modifications from a bare apprehension to a highly elaborate, cognitive operation presents a suggestion for investigation in this field. Two investigators, Judd and Cowling,[47] give us the barest kind of a description of perception as the result of an inquiry into the subject upon this very point. The gradual development of perception was determined, in their experiment, by the rate of learning to reproduce certain outlined figures. This was performed, first, with the eyes closed, secondly, with the eyes open and the drawings hidden, and thirdly, under visual control both of the movements and of the drawings. We have already noted (Sec. 4 above) that Judd is primarily interested in perception as described in terms of 'reaction' and 'adjustment', and so again we mark the characteristic failure of introspective description in the experiment just mentioned.

If we glance in review, then, over the problems which are concerned with perception, we see that they come under the eight headings enumerated, which in turn may be further divided into two large groups. The first would include the first four captions, the second, the last four. The former large division treats of

---

47. Judd, C. H., and Cowling, D. J., Studies in perceptual development, Psychol. Rev., Monog. Sup., No. 34, 1907, viii, 349.

perception in its general relation (a) to the environment, physical and bodily, and (b) to psychophysical preparation or predisposition. The last four groups may be classed together as treating of specific problems in perception: (a) peculiarities of perception, (b) relation of perception to thought, (c) perception in animals, and (d) the development of perception in the individual and in the race.

3. Methods of investigation of perception.

We have seen that the problems of perception are varied and numerous, and that they correspond to different interests, different points of view, and different modes of systematic formulation. Now as we advance to the discussion of methods and means of solution we may reasonably expect a like variety. The means which have actually been used in the study of perception we have collected from the journals and the monographs, and we find that they may be arranged under the following six categories; (1) logical, (2) introspective, (3) psychophysical, (4) comparative, (5) genetic, and (6) behavioristic. The interpretations put upon these terms agree with those proposed by Ruckmich.[48] The first is a rational principle applied for the sake of interpretation; the second, a method in the narrower sense; the third, a mode of procedure employed under experimental methods; and the fourth, fifth, and sixth are primarily points of view.

1. The logical method is the term which I have used to include all those procedures whereby unanalyzed experiences have

---

48. Ruckmich, C. A., A schema of method, Psychol. Rev., 1914, xxi, 401.

been brought together in the mass and by reflection interpreted. It is the sort of means which an investigator uses when he reasons out descriptions of mental experiences without subjecting them to experimental control or even to experimental identification. It is a general and uncontrolled manner of investigation to which psychologists still resort. To illustrate the point, we may refer to Aaronson's[49] interpretation of the relation of perception to knowledge and action, wherein he contends without experimental verification that a man of the dullest type would show more knowledge than the most perfectly contrived mechanical being because he is able to comprehend the meaning of the perception and suitably to adapt himself thereto. But there is no hint of experimental control and no test of presuppositions. Again, an application of this same method is shown in Grünbaum's[50] analysis of the psychophysiological nature of visual impressions of movement in primitive man, where analogies are drawn between structure and mental event and between modern and primitive man. Nevertheless,-in spite of its limitations,- the logical method of interpretation and investigation finds a place in solving just such problems as the last mentioned, where experimental control is impossible. It finds further application,too, in the description and interpretation of conscious moments, which are common to a great mass of people; e.g., the conception of an international war which brings the whole reading world into a single group.

---

49. Aaronson, I., Perception, J. of Philos.,Psychol.,Etc.,1914, xi, 37.
50. Grünbaum,A., Ueber die psychophysiologische Natur des primitiven optischen Bewegungseindrucks, Folio Neuro-biol.,1915, ix, 699.

Here again, a direct survey by experiment would hardly be feasible. But in the problems of perception the logical method should occupy a subordinate place.

2. Introspection is the one method peculiar to psychology alone. By it we mean the direct, controlled observation of mental phenomena for purposes of analysis and description. From these immediate observations the experimenter makes interpretations and correlations of fact. The introspective method is, however, interpreted in two distinct ways; first, and primarily, to analyze and describe mental processes; and secondly, to indicate and estimate meanings and relations, i.e., to give information concerning objects and to comment upon the progress of events.(a) The first application of the method is the one which has received a sanction from modern systematic psychologists, as every kind of mental event presumably lends itself to this means of investigation. There is no single kind of psychical material to which introspection is limited, and therefore, facts gained by any other method may be substantiated by the direct inspection of mind. Titchener has defined and outlined a schema of the introspective method[51] in which he maintains that introspection includes "an attention from the standpoint of psychology, and a record in the terms and under the captions of psychology." He further proceeds to distinguish two forms of introspection, the direct and the indirect; the first being an immediate description of the processes, the second, a description made upon the basis of reproduced processes,

---

51. Titchener, E. B., The schema of introspection, Amer. J. of Psychol., 1912, xxiii, 491.

or memorial image. Titchener's account of introspection substantially agrees with G. E. Müller's critical exposition of the preceding year.[52]

(b) The term introspection, used as a description of meanings, as a designation of knowledge about an object or as running comments upon an experiment, does not analyze in terms of process. By its terms the observer reports fragmentary knowledge of objects and conditions. Take, for example, the problem of the relation of thought to perception, investigated by Aveling. The observers were subjected to certain conditions which they reported as 'typical' or 'individual'. No attempt was further made to analyze the processes which carried this meaning. A few samples from the observations of Aveling's[53] observers will bring out the difference between facts gained through the informative method and the materials of introspection strictly taken. The mere description of the meaning is made evident by the following: "I did not see that as a type of a class. It was a letter-scale. The bars were yellow, the support black. I cannot draw it; for the meaning of the instruction came to me and troubled me. There

---

52. Müller, G. E., Zur Analyse der Gedächtnistätigkeit und des Vorstellungsverlaufes, Zsch. f. Psychol. u. Physiol. d. Sinnesorgane, 1911, Ergbd. v, 64. In describing the method, Müller says, "Von Selbstwahrnehmung rede ich überall da, wo in Beziehung auf einen psychischen Zustand durch unmittelbare Auffassung desselben oder durch Erinnerung an denselben etwas konstatiert wird, ... Wenn es sich um die Schilderung eines äusseren Gegenstandes handelt, kann die Beschreibung entweder auf Grund gegenwärtiger Wahrnehmung des Gegenstandes oder auf Grund der Erinnerung an eine oder mehrere frühere Wahrnehmungen des Gegenstandes erfolgen. Findet die Beschreibung auf Grund gegenwärtiger Wahrnehmung statt, so steht es stets so, dasz die zur Schilderung gelangenden Eigenschaften oder Teile des Gegenstandes sukzessiv die Aufmerksamkeit besitzen und ihren Besonderheiten in allgemeinen angemessene, von sprechenden Worten begleitete Apperzeptionen (Erkennungen) erfahren."

53. Op.cit., 221.

was an inhibition. No word came to consciousness. I at once thought of Nardis' machine. He had one." - - - "It was a pair of bluish nippers. No word came to consciousness. They were closed. I think I saw it as a picture and as type."

The 'informative' type of the method, which principally records running comments upon the experiment itself, falls as far short of describing consciousness in terms of processes as does the related type just illustrated, which yields bits of knowledge or reflection. No interpretation can be made concerning the actual composition of perception from confessions of the following character: "I can't say much of the first stage. The picture rolls on, but doesn't take a final interpretation at first. I feel there is a preparation for a definite final something. I had confidence of something definite which would come up when the picture was gone. Then I saw other parts, and the previous interpretation was choked down by this new sensation, and so the other never appeared in full consciousness." - - - "It's an awful effort to look at one thing. It's easier to be passive than active."[54] Such reports do not so much describe objects as merely comment upon the attitude of the observer during the period of experimentation or upon the course of the experiment itself.

3. The psychophysical methods[55] have played an important role since Fechner's time. They are peculiarly adapted to the study of relationships between stimulus and sensation. Since perception has its origin in the direct stimulation of receptor organs, all modes of procedure which may help illuminate the

---

54. Smith, F., An experimental investigation of perception, Brit. J.of Psychol., 1913-14, vi, 327, 333.
55. For discussion see Titchener E.B., Experimental psychology, II, Pt. II, Introduction, N. Y., 1905.

relations obtaining between stimulus and the attributes of sensation may be given a place in the study of this topic. The psychophysical methods have most frequently been applied to perceptions in the visual, auditory, and cutaneous fields, but are widely applicable where quantitative results are sought. An illustration of a psychophysical mode of procedure would be such an experiment as the determination of the influence of accommodation and convergence upon the perception of depth,[56] wherein the amounts of accommodation and convergence may be accurately measured and correlated with the degree of depth perceived; or, the determination of the influence of expectation upon localization of sound by the number of errors made.[57]

All the methods so far discussed are those peculiar to the psychology of the human individual. The other three modes of procedure which have helped solve problems of perception are the comparative, genetic, and behavioristic. All of these may be applied to organisms below man as well as to man himself.

4. The comparative method takes a mode of procedure peculiar to itself, namely that of inferring animal mind from human mind. One necessary step is a comparison of the animal and human forms in respect to structure, functions, and behavior. When an animal acts in a given manner under given conditions, the investigator constructs the animal mind on the basis of a comparison with human mind placed under similar circumstances, but with due allow-

---

56. Baird, J.W., The influence of accommodation and convergence, Amer. J. of Psychol., 1903, xiv, 150.
57. Geissler, L. R., op. cit.

ances made for differences of structure, function and manner of living. The literature upon animal psychology reveals many illustrations of this method. A representative instance is furnished by the article by Johnson already cited.[58] Johnson first determines the differences necessary in certain patterns to be perceived as discrete by both man and by the monkey and the chick. He then constructs the mind of the lower animals by an analogy to that of the human being.

5. The genetic method may likewise be applied to animals. An instance of an investigation carried on to determine the phylogenetic relationship of various organisms is furnished by Hamilton.[59] By subjecting various beings, as men and children of various ages, monkeys, cats, dogs, and a horse, to the same problem under the same conditions, a comparison was attempted between the reactions of the same species at different ages, and between animals of different species. This manner of approach is also applicable to problems dealing with the development within the individual. For example, the experiment of Judd and Cowling[60] referred to above, presents the problem of the genetic growth of perception in man with suggestions for a method for its solution.

An investigation of mind from the genetic point of view is advocated by Kirkpatrick, Yerkes, and Baldwin. According to Kirkpatrick, the methods of genetic and comparative psycholog-

---

58. Johnson, H. M., op. cit.
59. Hamilton, G. V., A Study of trial and error reactions in mammals, J. of Animal Behav., 1911, i, 33.
60. Judd, C. H. and Cowling, D.J., op. cit.

ists are similar. He believes that the student interested in mental growth must first know the structure and behavior of the simpler organisms and then, by inference, construct its mental life.[61] Yerkes,[62] likewise, implies the use of inference in the investigation of individual and racial mental development. Emphasis, however, is placed repeatedly upon the observation of organisms, especially upon the observation of behavior and its correlation with mental processes.

In Baldwin,[63] we find an entire program outlined and carried through. He assumes that mental growth is parallel to the development of the nervous system. The task involves a determination of the amount of mental development at various levels in the individual. The suggested manner of approach is that of the dynamogenic method,[64] or an interpretation of the development of the mind by its reflection in movement.

6. The behavioristic method does not attempt to describe mental phenomena as does the comparative method. In its extremest form, it seeks only to describe movements and to refer them to antecedent stimuli. An illustration of this method is to be found in an experiment by Bingham,[65] wherein no interpretation of mental processes is attempted. Even in the milder forms of behaviorism, perception is scarcely a problem in itself, but only

---

61. Kirkpatrick, E.A., Genetic psychology, N.Y., 1910, 3.
62. Yerkes, R. M., Introduction to psychology, N. Y.,1911,212.
63. Baldwin, J. M., Mental development in the child and the race, N. Y., 1895.
64. Ibid., p. 43.
65. Bingham, H. C., Size and form perception in Gallus Domesticus, J. of Animal Behav., 1913, iii, 65.

in so far as it is implied in the description and explanation of organic processes. And in the most uncompromising forms of this branch of ecological study, there is no place at all for the problems of perception.[66]

Thus we find that various paths of approach are available in connection with the problems of perception; though only one of them arrives at actual description in terms of process and form of integration. Our six methods fall into two natural groups. The first group, which includes the logical, introspective, and psychophysical forms, involves in various ways the individual whose mind is under investigation. The psychologist who makes use of the logical method bases his descriptions upon an analysis, more or less explicit and exact, of facts taken from his own experiences; the psychologist who employs the psychophysical methods is dependent upon the judgments of the observer; while the introspectionist finds his facts of perception by immediate observation.

The second group, which includes the comparative, genetic, and behavioristic forms, is characterized by a primary dependence upon the observation of overt actions or of other organic activities. From this common starting-point, the three diverge in their several interpretations of behavior. The first emphasizes the comparison of minds of different forms, the second, the development of mind, and the third, the correlation of response to stimulus.

---

66. Pillsbury (op. cit.14), however, maintains that facts gained from the observation of behavior should be substantiated by introspection.

CHAPTER II.

EXPERIMENTAL INVESTIGATIONS.

A. An analysis of perceptual complexes.

Problem and method. The main purpose of these investigations has been to obtain a descriptive analysis of perception. In the first series of experiments the primary object was to study certain fairly simple perceptual formations, laying special emphasis in our description, (1) upon the kinds of process involved, (2) upon the modes of their integration, and (3) upon the temporal sequence of the component members. For this purpose, twelve series composed of ten irregular inkblots[67] were used. There were five observers, C, Ra, Ru, S, and V.[68] The observer (O) was seated four feet from the exposure apparatus, a modified Whipple tachistoscope, which was employed throughout the experiments. Two seconds after a "ready" signal, a card, bearing an irregular inkblot (about 3 x 3 cm.) was exposed for .2 second. The following instructions were given to O.

---

67. These inkblots were similar to those used by G. V. Dearborn (A study of imaginations, Amer. J. of Psychol., 1897, ix, 183).

68. The observers, who served in these experiments were (in alphabetical order) a graduate student, Dr. Helen Clark (C); an advanced undergraduate, Miss Helen Davis (Da); and five instructors in the department, Dr. J. T. DeCamp (De), Dr. C. Rahn (Ra), Dr. C. A. Ruckmich (Ru), Dr. A. H. Sutherland (S), and Dr. T. F. Vance (V). The writer, takes this opportunity to express her sincere appreciation of their services and especially her indebtedness to Professor Bentley for his constructive criticism and supervision throughout the investigation.

"Two seconds after a preparatory signal is given, a visual field will be exposed. After the exposure, an auditory distraction stimulus will be sounded. At the signal, fixate and attend to the cross. After the exposure period, give (1) an introspective account of all mental processes occurring between the beginning of exposure and the distraction stimulus, and (2) a verbal description of all objects perceived."

At each sitting, a series of ten cards was completed. The twelve series were repeated twice, wholly or partially, for each observer, once with .25 second and once with .5 second exposure. The time of exposure was standardized by using a single, 'standard' card, when timing the apparatus. After the distraction stimulus, the introspections were recorded by the experimenter, who asked such questions only as were needed to clarify the reports. The O's were all given preliminary training on four series, similar to the main series, before the twelve main series were begun.

Results. From our introspective reports we find that, for the greater part, perceptual complexes are -- under our conditions -- composed of sensational and imaginal materials. A few representative introspections will illustrate the type of report and the critical analysis made of the experiences:

"First there was a complex of visual sensations, which meant nothing more than an inkblot of some form. The perception of these was not very clear. Then occurred a visual image of the inkblot, very weak, but persistent. After the image, there seemed to be a break in the direction of attention. During this time there was a great deal of eye strain, which meant an endeavor to clear up the meaning. The duration was intermittent and its intensity, low. There were also some kinaesthetic processes from the throat, but they were very vague and brought no definite words." (S)

"The greyness values of the blot were very clear, but meant nothing but an outline of some sort. Then came a visual image of a picture of shoes. The spot then meant this, and the image was assimilated right into the visual complex. Then came some

'throat' kinaesthesis and visceral sensations, meaning an endeavor to clear up the meaning." (Ru)

Affective processes were very seldom noted, and then seemed to be of minor importance for the perception, since they were usually attached to some individual component rather than to the complex as a whole. Of the sensational processes, the visual, by virtue of direct initiation under stimulus, played an important role in the total pattern, making up about twenty-six percent of the total number of processes reported for all exposures by all observers. But when we find, further, that processes, indirectly evoked within the body, the organic and kinaesthetic sensations, compose thirty-nine percent of the total number, those directly evoked seem to become of relatively less primary importance.

When the organic sensations occurred, they were always general, but with two possible variations; first, the 'thoracic' and 'abdominal' processes were closely integrated, and not distinguishable, or secondly, they were not closely fused and either one or the other stood out emphatically from the total complex. These processes by themselves, however, form but a small part (3%) of the entire group for all observers.

Kinaesthesis, on the other hand, represents the largest percentage (thirty-six) of any particular class of mental phenomena reported. Both muscular and tendinous sensations were observed. The muscular changes involved may be classified with respect to localization; they were either of the general, diffuse, bodily type, or specially localized in some definite part of the

body. The classes of muscular sensations as given in the order of frequency of occurrence are: general (474), verbal(348), ocular (178), head (72), chest and face (each 3), neck (2)and hand (1). The instances of tendinous strains are all very definitely localized in the eyes and head, with a frequency of 243.

Beside the sensational processes, both directly and indirectly evoked, introspection also reveals imaginal processes of various classes, visual, auditory, kinaesthetic, and tactual. All imaginal materials considered together form about a third (35%) of all processes; the visual alone, 27%; kinaesthetic, 7%; auditory and tactual each, .6%. From these proportions, it appears that visual imagery is of importance in visual perceptions. The distribution of the various processes in the different temporal phases for all observers is given in Table I.

The Table is a composite for 882 exposures of irregular inkblots, distributed among five observers.

The perceptions of the 882 exposures are distributed into 94 different formations. These modes of integration present various distinctive patternings of the seventeen different kinds of processes reported. Since there were 882 exposures, there were 882 possibilities of formations. But with all these possibilities, the fact that all can be ordered under 94 configurations, is significant that perceptions tend to conform to typical integrations. Thirteen of the most typical patterns, those with a frequency of eighteen or more, are given in Table II. The total frequency of these thirteen configurations is 460. Thus, while there was a possibility of 882 distinctively different patterns, over 50% conformed to thirteen integrations, or

TABLE I.

<table>
<tr><td>Type of Process.</td><td colspan="34">Sensational</td><td colspan="24">Imaginal.</td></tr>
<tr><td>Class.</td><td colspan="7">Visual</td><td colspan="5">Organic</td><td colspan="22">Kinaesthetic</td><td colspan="11">Visual</td><td colspan="4">Auditory</td><td colspan="6">Kinaesthetic</td><td colspan="3">Tactual</td></tr>
<tr><td>Subclass.</td><td colspan="7"></td><td colspan="5"></td><td colspan="5">Muscular General</td><td>Chest</td><td>Hand</td><td colspan="2">Head</td><td>Neck</td><td>Face</td><td colspan="3">Ocular</td><td colspan="4">Verbal</td><td colspan="4">Strain. Eyes & Head</td><td colspan="11"></td><td colspan="4"></td><td>General</td><td>Verbal</td><td colspan="4">Auditory-Verbal</td><td colspan="3"></td></tr>
<tr><td>Meaning of Complex.</td><td>F</td><td colspan="4">D</td><td>A</td><td>S</td><td colspan="5"></td><td colspan="22"></td><td colspan="3">F</td><td colspan="4">D</td><td colspan="2">A</td><td colspan="2">S</td><td colspan="4"></td><td colspan="6"></td><td colspan="3"></td></tr>
<tr><td>Phase of Consciousness.</td><td>1</td><td>1</td><td>2</td><td>3</td><td>4</td><td>1</td><td>2</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>2</td><td>5</td><td>2</td><td>3</td><td>3</td><td>2</td><td>1</td><td>2</td><td>3</td><td>1</td><td>2</td><td>3</td><td>4</td><td>1</td><td>2</td><td>3</td><td>4</td><td>2</td><td>3</td><td>4</td><td>1</td><td>2</td><td>3</td><td>4</td><td>2</td><td>3</td><td>2</td><td>3</td><td>1</td><td>2</td><td>3</td><td>4</td><td>3</td><td>3</td><td>1</td><td>2</td><td>3</td><td>4</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Total No. of Records for all Observers.</td><td>835</td><td>44</td><td>27</td><td>48</td><td>1</td><td>3</td><td>2</td><td>5</td><td>53</td><td>46</td><td>26</td><td>2</td><td>15</td><td>300</td><td>56</td><td>43</td><td>60</td><td>3</td><td>1</td><td>70</td><td>2</td><td>2</td><td>3</td><td>37</td><td>116</td><td>25</td><td>13</td><td>202</td><td>127</td><td>6</td><td>13</td><td>150</td><td>1</td><td>79</td><td>205</td><td>290</td><td>15</td><td>2</td><td>113</td><td>287</td><td>44</td><td>7</td><td>11</td><td>11</td><td>8</td><td></td><td>3</td><td>18</td><td>1</td><td>3</td><td>3</td><td>24</td><td>124</td><td>88</td><td>17</td><td>3</td><td>18</td><td>1</td></tr>
<tr><td>Total No. of Uses for Each Meaning.</td><td>835</td><td colspan="4">120</td><td>3</td><td>2</td><td colspan="5"></td><td colspan="22"></td><td colspan="3">510</td><td colspan="4">446</td><td colspan="2">18</td><td colspan="2">19</td><td colspan="4"></td><td colspan="6"></td><td colspan="3"></td></tr>
<tr><td>Percentages.</td><td>87</td><td colspan="4">12.5</td><td>.3</td><td>.2</td><td colspan="5"></td><td colspan="22"></td><td colspan="3">51</td><td colspan="4">45</td><td colspan="2">2</td><td colspan="2">2</td><td colspan="4"></td><td colspan="6"></td><td colspan="3"></td></tr>
<tr><td>Total of Subclass.</td><td colspan="7"></td><td colspan="5"></td><td colspan="5">474</td><td>3</td><td>1</td><td colspan="2">72</td><td>2</td><td>3</td><td colspan="3">178</td><td colspan="4">348</td><td colspan="4">243</td><td colspan="11"></td><td colspan="4"></td><td>3</td><td>3</td><td colspan="4">253</td><td colspan="3"></td></tr>
<tr><td>Total of Class.</td><td colspan="7">960</td><td colspan="5">132</td><td colspan="22">1324</td><td colspan="11">993</td><td colspan="4">22</td><td colspan="6">259</td><td colspan="3">22</td></tr>
<tr><td>Percentages.</td><td colspan="7">25.8</td><td colspan="5">3</td><td colspan="22">36.</td><td colspan="11">27</td><td colspan="4">.6</td><td colspan="6">7</td><td colspan="3">.6</td></tr>
</table>

TABLE II.

Order According to Frequency	Frequency.	Patterns.
1	79	$VS_F >$ Strain $S^{NS.} > VI_F$ / VI_D / Verbal Kinaesthesis $>$ Strain $S^{NS.} >$ General Kinaesthesis.
2	75	$VS_F >$ General Kinaesthesis $> VI_F$
3	68	$VS_F >$ General Kinaesthesis $> VI_D$
4	46	$VS_F >$ Kinaesthesis. (Head, Eyes, General, Verbal) $> VS_D$
5	28	$VS_F >$ Auditory-Verbal Images.
6	24	$VS_F >$ Strain $S^{NS.} > VI_F >$ General Kinaesthesis.
7	23	$VS_F >$ Auditory-Verbal Images $> VI_F$
8	22	$VS_F > VI_F$ / VI_D / Auditory-Verbal Images.
9	20	$VS_F > VI_F <$ VI_D, VI_D, VI_D / Auditory-Verbal Images.
10	20	$VS_F > VI_F$
11	19	$VS_F > VS_D$ / General Kinaesthesis. [Empathy].
12	18	$VS_F > VI_F > VI_D$
13	18.	VS_F / Ocular Kinaesthesis $>$ Kinaesthesis, General & Verbal $> VI_F > VI_D$
Total.	460.	

approximately to a seventh (14%) of the total number of combinations introspectively revealed.

These thirteen integrations further display striking similarities among themselves. In Table III they have been grouped according to sameness of process, of mode of integration, and of function.

1. Group I represents integrations of visual sensations, kinaesthesis, and visual imagery. There is but slight variation from formation to formation, the chief difference being one of temporal sequence. General kinaesthesis stands out as one of the essential factors in each pattern. In the last three, the diffuse bodily kinaesthesis is supplemented by special, localized kinaesthesis, as ocular and verbal. The visual imagery involved differs as to cognitive elaboration. First, it may be simply the reproduced perception, or secondly, it may be imagery with derived meaning.

2. Group II represents formations of visual sensations and visual and auditory - verbal imagery. The greatest difference between the four patterns is one of complexity with respect to the number of processes; the second may be considered as a greater elaboration of the first, in that the second terminated with a visual reproduction of the figure, which the first perception lacked. The remaining two formations are modifications of the second in respect to temporal sequence.

3. Group III is composed of but one type of integration. It is distinctively set off from the other groups by the fact that the object itself, changes from being apprehended as a mere irregular figure to one possessing a high degree of meaning.

TABLE III.

Group	Patterns.	Frequency	Total for Group.	Percentage.
I	VS_F > General Kinaesthesis > VI_F.	75		
	VS_F > General Kinaesthesis > VI_D.	68		
	VS_F > Strain Sensations > VI_F > General Kinaesthesis.	24		
	VS_F / Ocular Kinaesthesis > Kinaesthesis, General & Verbal > VI_F > VI_D	18		
	VS_F > Strain Sensations > VI_F VI_D / Verbal Kinaesthesis > Strain Sensations > General Kinaesthesis	79		
			264	58
II	VS_F > Auditory-Verbal Images.	28		
	VS_F > Auditory-Verbal Images > VI_F	23		
	VS_F > VI_F VI_D / Auditory-Verbal Images.	22		
	VS_F > VI_F < VI_D VI_D VI_D / Auditory-Verbal Images.	20		
			93	20
III	VS_F > Kinaesthesis (Head, Eyes, General, Verbal) > VS_D.	46		
			46	10
IV	VS_F > VI_F	20		
	VS_F > VI_F > VI_D.	18		
			38	8
V	VS_F > VS_D / General Kinaesthesis [Empathy].	19		
			19	4
	Total		460	100

4. Group IV is characterized by its absence of kinaesthetic and organic processes. Introspection revealed nothing but visual materials, sensational and imaginal. The second formation differs from the first in degree of meaning, the first never acquiring any more significance than that of an irregular, black figure. The temporal sequence is identical, with the exception that the second expanded into a third phase, in which derived meaning appeared attached to visual imagery.

5. Group V bears a strong resemblance to Group III with respect both to composition and to the function of some of the component processes. But there are also wide differences between the two groups as regards first, the function of other processes and secondly, the temporal course of the perception. First, as to similarities, the complexes of both groups are composed of visual and kinaesthetic sensations. Furthermore, the sensations of both groups, which were directly evoked, bear not only the meager meaning of an irregular figure, but also acquire other significance. As to differences, first in regard to function, the kinaesthetic factors serve two distinct purposes, that of effort or intent to seek meaning in the formations of Group III, and that of empathic interpretation in those of Group V. Secondly, there is a variation in temporal sequence. The visual processes bearing the derived meaning came subsequent to the kinaesthesis (effort) in the combinations of Group III, but accompanied the empathic kinaesthesis in those of Group V.

The groupings of these various perceptual formations may be determined not only upon the basis of similarity of combinations of processes by all observers, but also upon the basis of

typical integrative patterns for individuals. Group I is characteristic of all observers (C, 5%; Ra, 20%; Ru, 50%; S, 25%; V, 6%); Group IV, of three, Ru (6%), S (6%), and V (4%); Group V, of three, C (10%), Ra (27%), and S (8%); Group II, of two, C (11%) and V (24%); Group III, of one, S (33%). We may further say that the type of perceptual pattern included in Group I is especially characteristic of Ru; that of Group II, of V; of Group III, of S; of Group V, of Ra; while observer C displays a high frequency in both Groups II and V.

If the integrations should be combined with respect to function of processes, the first two would be closely related. While the processes of all but the first phase differ widely, first as to type, - those of the first group being sensational, those of the second imaginal, - and secondly, as to localization, - those of the first being general, those of the second, special, - nevertheless, the processes serve similar functions within the perceptions. Both the kinaesthetic sensations and the auditory-verbal images perform the function either of bearing meaning or of self-instruction to seek meaning in the figure. The difference in process represents merely individual variations in the interpretation of significance.

An examination of Tables II and III reveals the following facts:

1. Visual sensations alone, for the greater part, compose the first phase of the perception.

2. Kinaesthesis, general and special, is an important component within most perceptual complexes and usually occurs in

the second phase.

3. With very few exceptions, imagery, especially visual, occurs in every perception, but its appearance is, for the greater part, comparatively late in the temporal course.

From Table I we see that introspection revealed seventeen different kinds of processes within the perceptual complexes. Further investigation discloses the fact that these processes were distributed over no less than five temporal phases within the perceptions. Table IV represents the distribution of the various processes, with respect to kind and function, in the five temporal phases. The processes are arranged in each phase according to their order of frequency, from the greatest to the least.

Thus, in the first temporal phase of the perception, visual sensations, bearing the mere apprehension of the black figure, were the most frequent (835); the visual complex with derived significance, second in frequency (44); and so on. But parallel processes in the various phases are not to be interpreted as of approximately equal frequency; e.g., the occurrences of general kinaesthesis (300) in the second phases are not as numerous as those of VS_f in the first. The table simply indicates the relative importance of each kind of mental phenomenon in each temporal division of the total complex. While bodily kinaesthesis occurs in each phase, nevertheless it may be said to be most characteristic of the second; i.e., if it appears anywhere within a perceptual integration, it is more apt to be subsequent to the processes directly evoked. The Table IV further shows that the accessory processes in every phase but the first are of much more importance to the meaning of the perception than the concomitant,

TABLE IV.

	TEMPORAL PHASE				
ORDER.	1	2	3	4	5.
1	VS_F	GENERAL KINAESTHESIS	VI_F	STRAIN SENSATIONS.	GENERAL KINAESTHESIS
2	VS_D	VI_F	VI_D	VI_D	ORGANIC SENSATIONS.
3	OCULAR KINAESTHESIS	VERBAL KINAESTHESIS	VERBAL KINAESTHESIS	GENERAL KINAESTHESIS	HAND KINAESTHESIS
4	AUDITORY-VERBAL IMAGERY.	STRAIN SENSATIONS	AUDITORY-VERBAL IMAGERY.	ORGANIC SENSATIONS	
5	GENERAL KINAESTHESIS	AUDITORY-VERBAL IMAGERY	GENERAL KINAESTHESIS	AUDITORY-VERBAL IMAGERY.	
6	VERBAL KINAESTHESIS STRAIN SENSATIONS.	OCULAR KINAESTHESIS	VS_D	VI_F	
7	ORGANIC SENSATIONS	VI_D	ORGANIC SENSATIONS	VERBAL KINAESTHESIS	
8	VS_A	HEAD KINAESTHESIS	OCULAR KINAESTHESIS	VS_D, AUDITORY IMAGERY, TACTUAL "	
9	VI_D	ORGANIC SENSATIONS	AUDITORY IMAGERY TACTUAL "		
10		VS_D	VI_A		
11		VI_S	VI_S		
12		VI_A	GENERAL KINAESTHETIC IMAGERY, VERBAL KINAESTHETIC IMAGERY.		
13.		FACIAL KINAESTHESIS CHEST " AUDITORY IMAGERY TACTUAL "	HEAD KINAESTHESIS NECK "		
14.		VS_S	STRAIN SENSATIONS.		

directly initiated processes. For example, while the visual sensational processes may possess significance other than merely that of a black area on white, in the second, third, and even fourth phase, nevertheless various other complexes have precedence in frequency. Of course, with other materials, the perceptual value of the first phase might be greatly emphasized.

Perceptions, then, which arise from the observation of inkblots, are composed of three fundamentally different kinds of processes; (1) those directly evoked, (2) those which are related to organic movement, and (3) imaginal materials coming from various sources. These have all been shown to be of primary importance to the perception, each discharging its own peculiar service or supplementing that of other processes.

In this investigation, the visual complexes were found to be performing four functions. First the object was apprehended, either directly or indirectly, as being merely a black area on white.

"The visual complex simply meant an irregular figure of some sort." (Ru)

This type of meaning we shall designate as the figurational function (VS_f or VI_f). Secondly, the same complexes were involved in the ascription of other meaning, in depicting the figure as some particular object (VS_d or VI_d, depictive function).

"The figure meant a bull-moose, horns and all very definite." (S)

These meanings were usually rejected one after the other. Thus, although the function of these processes seemed to be descriptively to elaborate and enrich meaning, nevertheless they represent effort and intent, on the part of the observer, to interpret the significance of the object. Thirdly, the visual

processes may not depict a particular object as a particular hill, tree, or house, but may bear the meaning of a concept, as of quadruped in general, or triangularity.

"In the perception, the object immediately became a general representation for an animal like a centipede." (S)

We have designated this function as abstract (VS_a and VI_a). Fourthly, the figure may be apprehended, not as some definite particular object, but as a representation of an object, as a symbol (VS_s and VI_s, symbolic function).

"The visual and auditory imagery carried the meaning that this was a symbolic representation of a waterfall." (Ru)

Reference to Tables I and II reveals that in the perception of figures, which possess nominal or slight meaning, the visual processes more frequently display figurational and depictive functions than abstract and symbolic. While the figurational and depictive functions, taken together, occur with approximately the same frequency in the sensational (955) as in the imaginal (956) processes, yet there is a decided difference when considered separately; 835 of the visual sensational complexes were figurational and but 120 depictive, while, in the case of imagery, 510 were figurational and 446 depictive, thus indicating that imagery may be of slightly more importance than sensations in giving derived significance.

Likewise, in the case of abstract and symbolic functions, there is a greater frequency in imagery than in sensations. Thus, the primary function of the directly initiated processes becomes one of bare apprehension of object, while that of imaginal materials is to elaborate upon the meaning.

Whatever meaning the perception possessed usually came with the visual complexes. The kinaesthetic and organic processes,

sensational and imaginal, did little to add to or substantiate it. Their chief function was (1) to bear effort or intent to find significance in the figure, or (2) to question the fitness of meaning ascribed by other processes. Thus, they were accessory to the visual complexes rather than directly assimilated with them. Group V of Table III, however, is an exception to this kind of function. In this mode of integration the empathic kinaesthesis substantiated the meaning attached to the visual sensations, thus actually displaying a depictive function, although the interpretative function is still evident.

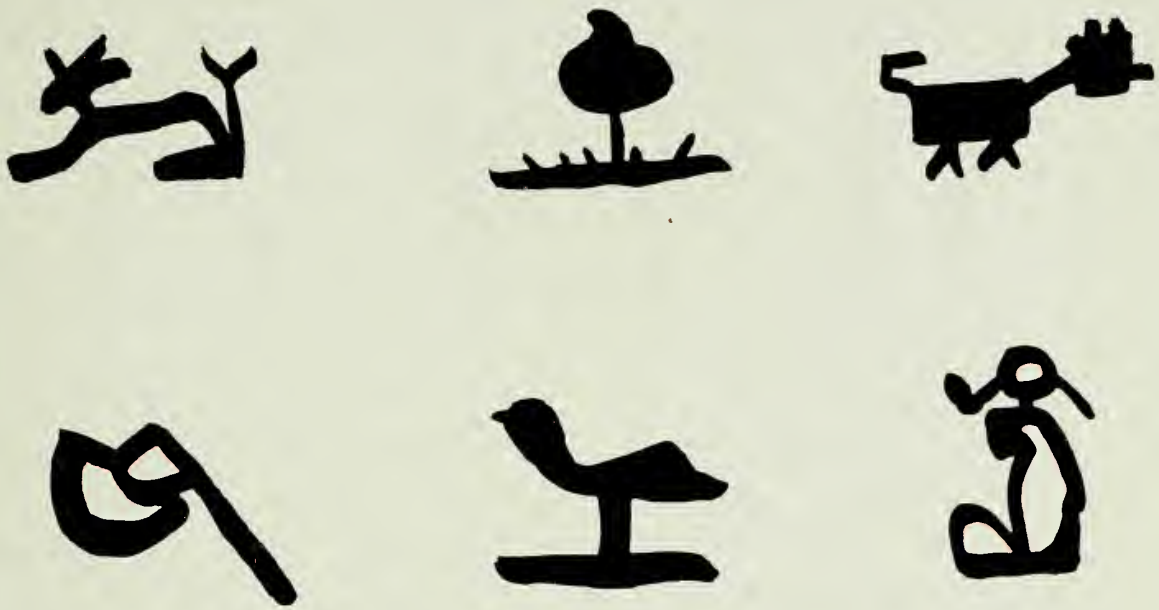
The auditory and tactual imagery perform a service similar to that of the organic and kinaesthetic processes; i.e., they carry self-instructions to seek meaning in the figure, or to determine the appropriativeness of significance. They primarily represent individual differences in the observers in the interpretation of the figures. Auditory and auditory-verbal imagery in the cases of C and V, and tactual imagery in the case of Ra, discharge the same office as kinaesthetic processes do for other observers and frequently for these same observers.

Summarizing our experimental results thus far presented, we may say that perceptions have a tendency to integrate into certain typical formations, which possess some peculiarities due to individual differences, but which nevertheless conform in general to common patterns. Within these configurations, the various processes follow a temporal course fairly definitely determined: the directly evoked sensations showing a marked precedence over all others in the first phase, the indirectly initiated sensational

complexes composing the greater part of the second, and imaginal phenomena having predominance in the third. The different processes which compose the perception, also perform particular functions; the visual processes bear the meaning, while those connected with organic movement and the imaginal components interpret any significance which the figure may possess or derive.

B. The elaboration of perceptual meaning.

Problem and method. Typical integrations having been established for perceptions of figures with very slight or nominal significance, it became the primary task of this immediate part of the investigation to determine whether any change occurs in perception when material with a slightly higher degree of significance is used. For this purpose, we availed ourselves of any suggestions which we might get from hieroglyphics and cubists' drawings. A series of 50 cards was made, bearing objects which possessed varying degrees of suggested meaning. The following illustrations are typical of the series.



These were exposed for half a second to the observers, C, Ra, and Ru. The instructions were as follows:

"Two seconds after a "ready" signal, a figure will be briefly exposed. A distraction will be given at the end of two seconds. Upon distraction, report at once whether the figure is wholly devoid of significance. Then give full introspections."

Results. No difference in composition was discovered between the perception of inkblots with minimal meaning and the perception of figures possessing a greater degree of significance.

The complexes also revealed integration similar to that of the first set. But, although there is no difference on the side of composition, there is a marked variance in the function of the different processes. Whereas in the perceptions, reported under the first experiment, the processes all bore the same general function of seeking and interpreting meaning, the same processes also serve other purposes when the object becomes more meaningful. In this series of investigations, we have distinguished three kinds, interpretative, appreciative, and orientating.

The interpretative function is the same type that we found so prevalent in the perceptions of the first experiment. It is the effort or intent on the part of the observer to read meaning into the object. The following excerpts will illustrate its application as related to various types and classes of mental phenomena:

"I felt myself (general, empathic, kinaesthesis) standing erect and rigid, and then the meaning grass came." (C)

"There was a very clear auditory image of the word "bowl" and with it a general kinaesthetic set which meant the realization that the object was not like a bowl. Kinaesthesis of the hands and tactual imagery gave roundness to the top." (C)

"There was much organic disturbance, which meant that the figure was complex, that it was a problem, which I must solve." (Ru)

"Visual images assimilated with visual sensations gave the meaning of solidity." (Ra)

These illustrations not only indicate a similarity to the interpretative function of the processes in experiment 1, but also a difference. In experiment 1 we found that the interpretation was of the desiring, seeking, searching type without any satisfactory fulfillment, i.e., if derived meanings did occur as a result of the search, they were usually rejected or at least not wholly

accepted. In experiment 2 we see from the illustrations quoted that there was an intent and desire to derive meaning, which was, however, not so much a futile seeking and searching as the kind of interpretation that comes with fulfilled desire and satisfactory realization.

Both sensational and imaginal component processes may serve to seek meaning in the object. The sensations, which function in this manner may have a definite (visual) or general (organic and kinaesthetic)origin. In the case of imagery, the materials are drawn from various sources, specific, as visual, auditory, and olfactory, or general, as tactual and kinaesthetic. The interpretative function, then, is not peculiar to a particular class of mental phenomena, although effort itself is directly connected with kinaesthesis.

The second, or appreciative function, is the term we have employed to designate the service of a process or complex of processes when the figure is valued, i.e., when it gives rise to pleasure, enjoyment, or aesthetic sentiments. Examples follow.

"There was a general, kinaesthetic and organic complex, meaning amusement because the dog was so fantastic and that it was so ridiculous for a live dog." (C)

"There were numerous visual images of scalps, skins and of tortoise shell combs of variegated colors. With this was a pleasant organic complex. The total complex signified the richness of meaning of the object." (Ru)

"There was a background of visual imagery, associations from the history of man, carrying an appreciation of the feeling of unity with man." (Ra)

The meaning in each case seems to have been completely evolved by antecedent processes, and when the phenomena, mentioned above, appeared, their primary function was to appreciate this

significance.

As regards the interpretative function, we found that any kind of mental phenomena might fill such an office, whereas only the indirectly evoked sensations (organic and kinaesthetic) and imaginal processes carry the appreciative function and moreover that the imaginal processes which here functionate as appreciation are limited to the two classes, visual and kinaesthetic verbal. This would seem to indicate either, (1) that the meaning of these perceptions was not yet complex or evident enough to involve many processes in appreciation, but still demanded much interpretation, or (2) that fewer kinds of process actually perform this valuating or estimating service.

The orientating function is a third kind of performance distinctive from either the interpretative or the appreciative. There is no effort or attempt involved to attach purport to the object, nor is there any valuation of such meaning as may be present, but the processes functionate in placing or localizing in time or space the object with reference either to the observer or to other objects.

"There were some organic processes in the background, allied with kinaesthetic processes which gave the object position." (Ru)

"There was confused visual imagery referring to drawing classes where they had drawings of friezes, of Egyptian designs, and of Greek and Roman figures." (C)

"There came an auditory image of the words, "bizarre twist" which was accompanied by auditory imagery referring it back to other diagrams, which meant bizarre twist." (Ru)

"This reference to books on archeology came in terms of visual imagery of pictures and kinaesthetic-tactual imagery of the feel of the page with print and pictures." (Ra)

The orientating function, then, is characteristic of organic and kinaesthetic sensations and of imaginal processes from various sources. Of the images which are derived from definite sources, we find the visual and auditory occurring; of those with a diffuse origin, the tactual and kinaesthetic.

Although three kinds of functions may be assigned to the various processes, nevertheless, as far as our results indicate, we cannot say that functions are of equal importance in giving meaning to the perception. In Table V the total number of processes has been recorded under each function with respect to its capacity for carrying these three kinds of significance. The interpretative, appreciative, and orientating functions are indicated by I, A, and O, respectively. The symbols, + and -, indicate whether or not processes, discharging particular functions, added to the significance of the perceptions, - a significance, which had already been derived; e.g., the meaning 'horn' is already attached to a visual complex, when an auditory image of the word horn subsequently occurs. The latter supplies nothing new to the context.

From an inspection of Table V, we may conclude from these experiments that:

1. In perceptions possessing a moderate degree of meaning, processes, serving for interpretation, are approximately twice as frequent (436) as processes which valuate and localize (241) the object. This observation points to the fact that the meaning was not so evident but that most of the components in the perceptual process stood for effort or intent to attach significance to the figure.

TABLE V.

Observers.		No of + and − Processes.								Total No. of Processes.			
		I		A		O		A.&.O		I	A	O	A.&O.
		+	−	+	−	+	−	+	−				
C	Totals	152	27	21	0	42	17	63	17	179	21	59	80
Ra	Totals	77	18	8	1	15	9	23	10	95	9	24	33
Ru	Totals	96	66	35	1	57	35	92	36	162	36	92	128
C	Percentages.	59	10	8	0	16	7	24	7	69	8	23	31
Ra	Percentages.	60	14	6	.8	12	7	18	7.8	74	6.8	19	25.8
Ru	Percentages.	33	23	12	.3	20	12	32	12.3	56	12.3	32	44.3
	Grand Totals	325	111	64	2	114	61	178	63	436	66	175	241
	Percentages	48	16	9	.3	17	9	26	9.3	64	9.3	26	35.3

2. Every kind of component in the perception shows a greater tendency to be positive rather than negative to the meaning; i.e., in every instance, the processes which contributed to the meaning greatly outnumber those which failed to enlarge the significance. All of the 'appreciative' processes, with two exceptions, enriched meaning. The phenomena which localized the object, however, made no contribution to the meaning about half as frequently as they added thereto. Although we have said that processes add or fail to add meaning, we cannot say how much each process contributes to the significance of each perception. For example, - to take a typical illustration, - we perceive an irregular figure which assumes the derived meaning of cannon, by virtue of the visual sensations themselves. Then O calls forth a visual image of this spot, still possessing the meaning cannon. In this instance, it is evident that the sensations were of much more importance to the meaning than the images, and that although there were two types of process we cannot say that each contributed one-half the meaning. Meaning itself is 'richer', 'poorer', 'more or less elaborated'; but it is not divisible into fractional parts.

3. After the interpretative processes have run their course, other processes have a greater tendency to serve in placing the object in space and time than for appreciating it. There are approximately three times as many "O" as "A" processes.

4. From the general results of Table V, there seems to be a temporal evolution of the various functions of process from perceptions with minimal meaning to those with considerable mean-

ing. When meaning is minimal, the processes serve for bearing and interpreting it. As meaning becomes more elaborate, the processes acquire other functions, first that of localization, and secondly that of appreciation.

Table V also reveals some individual differences with respect to the functional aspect of mental phenomena.

1. The "I" processes vary from 56% for Ru to 74% for Ra. (This difference should be considered in connection with Table VI below.)

2. Ru shows a higher ratio between his "O" and "A" processes and his "I" processes than either C or Ra.

3. There are also marked differences with respect to the relation of the processes to the meaning. Ru has approximately as many "A" and "O" as "I" processes which add to the meaning, while C and Ra show a predominance of positive "I" processes. In Ru's perceptions also, the "I", "A", and "O" processes which do not add to the meaning have a lower ratio to those that are positive than is true in the case either of C or Ra.

We have seen that there is a tendency for the "A" and "O" processes to increase in frequency as meaning becomes more elaborate. In our next table (VI) this relationship of process to degree of meaning becomes more clearly apparent. Here the meaning of the object has been designated as "none", if it possessed no significance other than that of a black area on white. It will be recalled that this series was purposely so made as to bear varying degrees of suggestion. "Slight" indicates that there was present a low degree of meaning, which was usually indicated by hesitation on the part of the observer to accept it, or by lack

TABLE VI.

Observers		Meaning: None I	None A	None O	None A&O.	Slight I	Slight A	Slight O	Slight A&O	Considerable. I	Considerable. A	Considerable. O	Considerable. A&O
C	Totals	12		2	2	58	5	18	23	109	16	39	55
Ra	Totals	7		3	3	26	2	7	9	62	7	14	21
Ru	Totals					48	8	27	35	114	28	65	93
C	Percentages	5		.8	.8	22	2	7	9	42	6	15	21
Ra	Percentages	5		2	2	20	2	5	7	49	5	11	16
Ru	Percentages					17	3	9	12	39	10	22	32
	Grand Totals	19		5	5	132	15	52	67	285	51	118	169
	Percentages	3		.7	.7	19	2	8	10	41	8	18	26

of details, or by the predominant function of all the processes involved. "Much" indicates that the object was rich in detail and setting.

In the case of "no" meaning, the results quoted in Table VI show that but few processes with the orientating function occurred and none of the appreciative type. But in perceptions, which possess "slight"meaning, there is a greater frequency both of the"A" and "O" kinds of process with a greater prevalence of the "O" type. The same is true of complexes listed under the third degree of meaning. This further substantiates the statement made above that as meaning develops more and more the accessory components of the perception acquire new functions, namely, the orientating and the appreciative. The processes discharging these services also vary directly in frequency with the significance. Table VI further shows that, if judged by frequency, the same classes of process assume the orientating function before the appreciative; i.e., in the instances of "no" meaning, there were but few "O" processes, and no "A" processes, while in the other instances, the "O" processes always exceed the "A's". This fact illuminates the reason for Ru's displaying such a high frequency of "A" and "O" processes (Table V). From Table VI, we see that Ru reported no perception under the "none" degree of meaning.

These facts accord with those of the first series of experiments, where, with the exception of the perceptual integrations listed under Group V of Table III, all accessory processes presented clearly the interpretative function, since the figures used in those experiments possessed just as little mean-

ing as possible. In the case of perceptions, which involved empathic kinaesthesis, which was mostly interpretative, but with a suggestion of the localizing function, the objects were probably of the same degree of meaning for the various observers as those judged as having "no" meaning in the second series of 'object' cards.

The following general conclusions may be drawn from the results of experiment 2:

1. The accessory processes, kinaesthetic and organic sensations and various imaginal components, acquire functions other than the interpretative, as meaning grows more elaborate. In this experiment these new services have been found to be appreciative and orientating.

2. The accessory processes, performing these appreciative and orientating services, increase in frequency directly with the degree of meaning.

3. The various functions of mental processes appear in a definite order, in perceptions of varying degrees of meaning; (1) interpretative, (2) orientating, and (3) appreciative.

C. Relation of attention to perception.

Up to this point our experimental results have shown us, first, that perceptions fall into typical integrations, secondly, that perceptions present various degrees of cognitive and appreciate elaborations, and thirdly, that the elaboration of significance is relatively independent of the particular kind of mental processes involved. But our analytic problem is not yet complete. We must not neglect the state and the configuration

of the totalbit of mind in which the perceptual complex is embedded. This is the problem of the relation of attention to perception. We approach it by taking an inventory of all the processes, at their several degrees of clearness, which lie both within and without the particular constellation which we have undertaken to study.

A. Preliminary series.

Problem and method. In order to train our subjects to observe these degrees of clearness or vividness, two series of preliminary experiments with distraction were performed. In the first, a series of nonsense-syllables was exposed, approximately one each second, which was to be memorized by the observer. Some time during the learning period a distraction was offered by drawing a pattern upon the back of O's left hand with the blunt end of a pen shaft. At a signal "now", O introspected for that instant, estimating the various processes according to nine degrees of clearness.

The second series of experiment consisted of a double task. O was given one of the cancellation test-sheets and asked to mark all "a's". While he was thus engaged, simple arithmetical sums and multiplications were orally given and their solution demanded. At a signal "now" full introspections were reported with respect to the clearness of the processes, which were present just at the signal "now". The experimenter in both series always attempted to give the signal "now", while the observers were being distracted either by the pattern or by the computation.

The instructions for the first series read as follows:

"A "ready" signal will be given. Two seconds later, the first of a series of nonsense syllables will be exposed. Learn the series. During the learning period, a distraction will be given by drawing a pattern on the back of your hand. At a signal "now", give an introspective account of the degrees of clearness of all processes, present at the signal "now". The degrees of clearness are to be judged in the following terms:

maximally clear ---- 1
very clear --------- 2
clear -------------- 3
fairly clear ------- 4
fair --------------- 5
fairly vague ------- 6
vague -------------- 7
very vague---------- 8
obscure ------------ 9."

Instructions for the second series were:

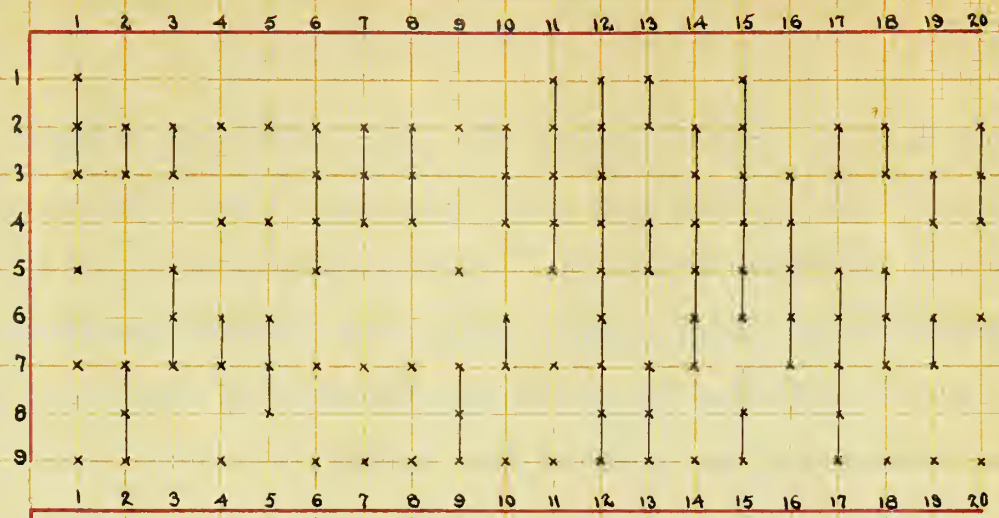
"A "ready" signal will be given. Two seconds later a signal "start", at which begin crossing out the "a's" on the sheet before you. During this process, simple arithmetical additions and multiplications will be given for about two seconds. At a signal "now", give an introspective account of the degrees of clearness of all the processes, present just at the signal "now". The degrees of clearness are to be judged in the following terms; (the same 9 degrees were used as for the first series)."
The observers were C, De, Ra, and Ru.

Results. The two preliminary series of experiments resulted not only in training the O's in the use of the degrees of clearness, but also determined the type of consciousness of each observer, whether it was of the foreground-background type or multi-level. Graphs I - IV, showing the results for nonsense-syllables, illustrate individual differences.

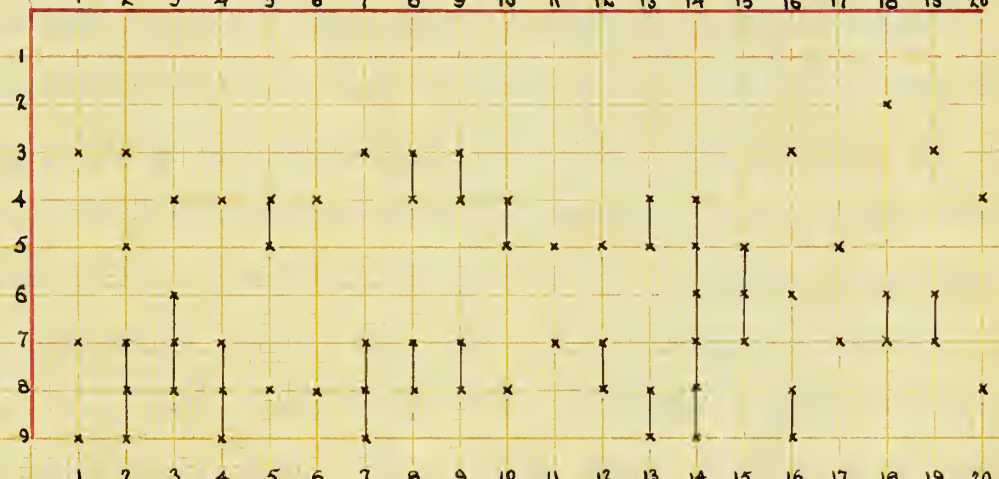
In the graphs, the trials are ordered on the abscissae; the degrees of clearness on the ordinates. Adjoining degrees are connected by solid vertical lines.

The diagrams then suggest that C and Ra, and possibly also De, represent multilevel types of mind. The data for the double task series indicate results similar to those for the first series.

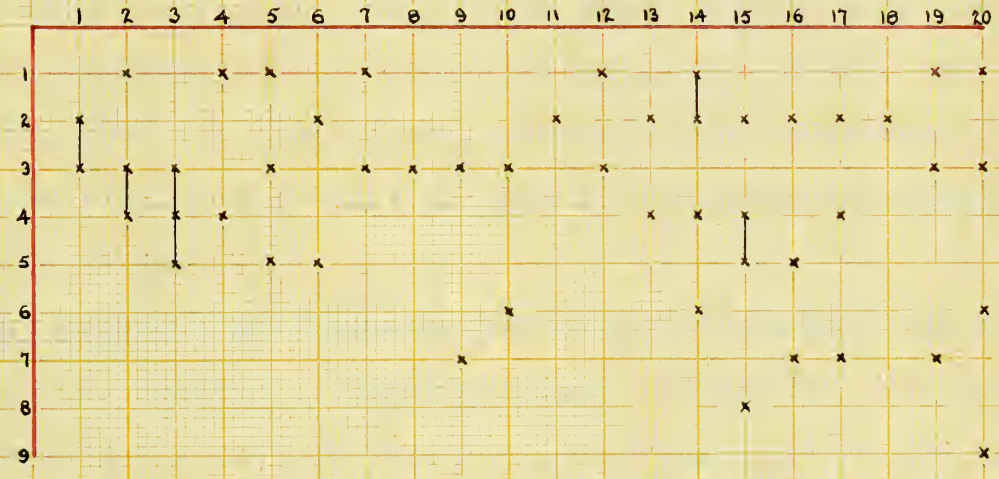
GRAPH I
O=C



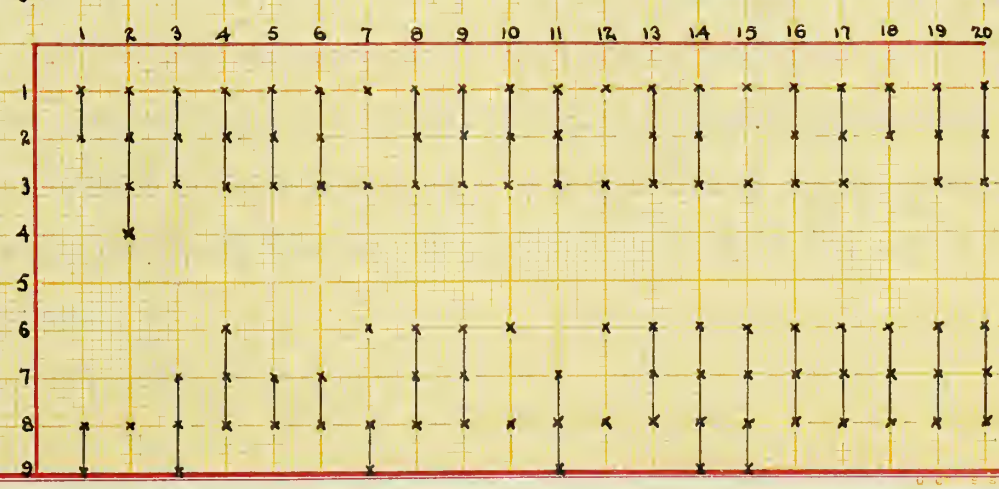
GRAPH II
O=DE



GRAPH III
O=RA



GRAPH IV
O=RU.



Both are included in Table VII. The symbols, "N-S" and "A" on Table VII are employed to represent the nonsense-syllables and the cancellation sheet, respectively. It may be said in general that the observers exhibit a similar distribution of processes among the nine degrees of clearness with the exception of Ru, whose two-level division reduces the numbers for the medium and the very lowest degrees. And again, when Ru's estimations of vividness are divided into three large groups (for the sake of inspection), there is practically an equal distribution for each group. Ra, while he grouped most processes in the middle level for the N-S series, nevertheless exhibits a greater frequency among the maximally clear than among the obscure processes. In his "A" series, very clear processes are more frequent than those which are moderately clear, with still fewer obscure components. The general tendency for all observers seems to indicate that most factors within the perceptual complexes are moderately clear, fewer are obscure, and a still smaller number maximally clear.

B. Main series.

Problem and method. The primary task of this investigation was to estimate the bearing of clearness upon perception. To this end, the original series of inkblots (see experiment 1) was again used. As before the observer gave full introspective reports concerning the perception, but in addition the clearness of each process was given on the scale of 1 - 9 according to the method employed with nonsense syllables and the literal tests of our preliminaries.

The instructions read:

TABLE VII.

Clearness Values	9 Degrees																3 Degrees.											
	C				De				Ra				Ru				C				De				Ra				Ru			
	N-S		A		N-S		A		N-S		A		N-S		A		N-S		A		N-S		A		N-S		A		N-S		A	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	5	3	1	4					15	17	17	30	30	18	18	14																
2	18	14	17	8	10	6			19	22	10	18	25	15	20	16	23	18	18	9	10	6			34	40	27	47	55	32	38	30
3	18	14	28	13	31	19	9	7	14	16	6	11	28	16	19	15																
4	16	12	37	17	20	12	35	26	10	12	4	7	2	1																		
5	14	11	27	13	23	14	22	16	8	9	8	14	2	1	14	11	62	48	118	55	98	61	78	58	38	44	21	7	56	33	53	42
6	14	11	26	12	24	15	12	9	6	7	3	5	24	14	20	16																
7	19	15	23	10.6	27	17	21	16	10	12	3	5	22	13	17	13																
8	7	5	27	13	19	12	29	22	3	4	2	3	30	18	19	15	45	34	77	36	54	33	56	42	14	16	9	16	59	35	36	28
9	19	15	27	13	8	5	6	4	1	1	4	7	7	4																		

"Signal, exposure and distraction-stimulus will be given as before. During the whole period of observation take the perception quite passively; do not force an "object". Give full introspections, indicating perceptions and other meanings in parallel with the description of processes. The introspections should include (a) analysis of complexes, (b) the sequence and order of groups, and (c) the area of maximal clearness. The degrees of clearness are to be judged in the following terms: See instructions for preliminary series."

The time of exposure was half a second, but introspection covered a period of two seconds. C, De, Ra, and Ru served as observers.

Results. Tables VIII - XI present a tabulation by observers with respect to kind of process, degree of clearness, and phase of perception. They include only processes relevant to the perception and not those of the total mind.

When the various kinds of process are considered with regard to their frequency, in the nine classes, wide individual variations in relative clearness appear; but they largely disappear again when the nine degrees are reduced to three. For example, we find upon inspection of the Tables that the visual sensory complexes occurred fairly well distributed under the nine values for C and Ra, while they all belonged to Ru's area of maximal clarity, and with few exceptions in the range of moderately clear components for De. And again, with reference to the kinaesthetic complexes, which are common factors for all observers, there is a decided tendency for them to be of very low level in the case of C, but of moderate clearness for all others. The extent of distribution does seem to bear some relation to the predominant type of process; e.g., C, De, and Ra, who reported visual sensations under at least seven of the nine categories, possess a predominance of visual sensations over

TABLE VIII (O = C)

CLEARNESS VALUES	1			2			3			4			5			6			7			8			9			TOT. ALL VALUES			%			TOT. PROCS IN 3 PHASES	%	TOT. IN TYPE OF PROC.	%	TOT. IN CLASS OF PROC.	%
PHASE	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3						
PROCESSES.																																							
VISUAL.																																						207	37.3
SENSATIONS.	4			21	11		27	10		20	6	1	4	4		5	2		4			1		1	2			88	33	2	16	6	4	123	22	123	22		
IMAGES.																																				84	15		
SPOT.						1					1	1		1			8	1		7	3	1	5	5		2	7	1	24	18	.2	4	3	43	8				
ASOC'NS.						1					3			2	2		2	6		6	9	1	1	5		3		1	17	23	.2	3	4	41	7				
AUDITORY-IMAGES					1	3		8	10		7	5		7	1		7	2	2	3	1		5	3		1		2	39	25	4	7	5	66	12	66	12	66	12
CUTANEOUS- "																																						2	4	2	4
PAIN																								2						2			4	2	4					
ORGANIC SEN'NS.														1		1						1	1	3		2	2	2	4	5	4	.7	.9	11	2	11	2	11	2
KINAESTHESIS																																						268	48.3
SENSATIONS																																				231	42		
MUSCULAR																																							
GENERAL				2					3	3				6	3	9	6	1	27	10	3	22	18	13	18	18	9	81	58	32	15	10	6	171	31				
LEGS.																1												1			.2			1	.2				
ARMS.										1		1				1	2		4	5	1	1	6	1	2	1	2	9	14	5	1	2	.9	28	5				
FACE												1			1									3						5			.9	5	.9				
EYE																							1			1		1	1		.2	.2		2	4				
THROAT																			1	2		1		2				2	2	2	4	4	4	6	1				
VERBAL																																							
STRAIN.																																							
NECK.				1								1				1		1	2				1					4	1	2	.7	.2	.4	7	1.3				
FACE																						1						1			.2			1	.2				
EYE				1								1				1		1	3				1					5	1	2	.9	.2	.4	8	1.4				
THROAT											1										1								1	1		.2	.2	2	.4				
IMAGES.																																				37	6.6		
GENERAL																	1			1									2			4		2	.4				
AUD. VERB.		2	1		6	6		6	6		4				2						1						1		18	17		3	3	35	6.3				
TOTAL No. OF CLEARNESS VALUES BY PHASES.	4	2	1	25	18	11	27	24	18	24	22	11	4	21	9	19	28	12	43	34	19	29	39	38	23	27	21	198	215	141									
TOTAL FOR ALL PHASES.	7			54			70			57			34			59			96			106			71			554											
PERCENTAGES.	1			10			13			10			6			11			17			19			13			36	39	25									
TOTAL No. OF VALUES IN THREE LEVELS	61						220												273																				
PERCENTAGES.	11						40												49																				

TABLE IX. (O=DE)

Clearness Value.	1			2			3			4			5			6			7			8			9			Tot. all values.			%			Tot. Proc's in 3 Phases	%	Tot. in Type of Process	%	Tot. in Class of Process	%
Phase	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3						
Processes.																																							
Visual																																						101	64
Sensations.							10			11	1		20			11			5			2			1			60	1		38	.6		61	39	61	39		
Images.																																				38	24		
Spot									1		2			2	2		3	1		3	2	4	9	4	1	4	2	5	23	12	4	15	7	38	24				
Kinaesthesis.																																						57	36
Sensations																																				5			
General																						3	1					3	1		2	.6		4	3		4		
Arms																							1						1			.6		1	.6				
Images																																				52			
Verbal				1	1	1	4	2	1	7	4		6	1	1	7		1	5	1		3	4	1				33	13	5	21	8	4	51	32		33		
General																				1									1			.6		1	.6				
Total No. of Clearness Values for Phase.				1	1	1	14	2	2	18	7		26	3	3	18	3	2	10	5	2	12	15	5	2	4	2	101	40	17									
Total Value for all Phases					3			18			25			32			23			17			32			8			158										
Percentages.					2			11			16			20			15			11			20			5		64	25	11									
Total No. of Values in 3 Levels.			3						98									57																				
Percentages.			2						62									36																				

TABLE X (O = RR.)

Clearness Values	1			2			3			4			5			6			7			8			9			Total for all Values			%			Tot. Proc's in 3 Phases	%	Tot. in Type of Process	%	Tot. in Class of Process	%
Phase	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3						
Processes.																																							
Visual																																					134	59
Sensations	16	1		20	8	1	6	6	1	6	6		5	7	3	3	3	2	3	2		1	1	1				60	34	8	26	15	4	102	45	102	45		
Images.																																				32	14		
Spot					2			2							1		1			1									6	1		3	4	7	3				
Assoc'ns		1		2	6		4	2	3		1			1			2	1		1	1						6	14	5	3	6	2	25	11				
Auditory Images					1			1		1							1											1	3		.4	1		4	2	4	2	4	2
Cutaneous "																																							
Pressure	2	1		4	4				1	3	2						2											9	9	1	4	4	.4	19	8	19	8	19	8
Organic Sen'ns.		1			1			1			2		1	1														1	6		.4	3		7	3	7	3	7	3
Kinaesthesis.																																					64	28
Sensations																																				24	10		
Muscular																																							
General				2	2			1									1		2			1						5	4		2	2		9	4				
Shoulders	1																1											1	1		.4	.4		2	.8				
Arm	1						2							1														3	1		1	.4		4	2				
Head	1				1												1		1									2	2		.8	.8		4	2				
Eye								1		2																		2	1		.8	.4		3	1				
Forehead								1								1												1	1		.4	.4		2	.8				
Imrges.																																				40	18		
General	3	2		5	3	1	3	2	1	2	2		2			1	3		1	1					1			18	13	2	8	6	.8	33	14				
Arm.																																							
Hand.				1	2					1	1			1														2	4		.8	2		6	3				
Aud. Verb				1																								1			.4			.1	.4				
Total No. of Clearness Values per Phase.	24	6		35	30	2	15	17	6	15	14		8	11	4	5	15	3	7	5	1	2	1	1	1			112	99	17									
Total for all Phases.	30			67			38			29			23			23			13			4			1			228											
Percentages	13			29			16.6			13			10			10			6			2			.4			49	43	8									
Total No. of Values in 3 Levels.	97						113												18																				
Percentages.	42						50												8																				

TABLE XI (O=Ru.)

Clearness Value	1			2			3			4			5			6			7			8			9			Tot. for all values			%			Tot. Proc's in 3 Phases	%	Tot. in Type of Process	%	Tot. in Class of Process	%
Phase	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3						
Processes																																							
Visual																																					261	36
Sensations.	77	20	3	9	8	1	2	5	1																			88	33	5	12	4	.7	126	17	126	17		
Images.																																				135	19		
Spot		1		3	7	1	3	3	2												1							6	11	4	.8	2	.5	21	3				
Assoc'ns.		10	13	23	39	7	6	7	5								1	3										29	57	28	4	8	4	114	16				
Organic Sen'ns.							2	5	3				30	29	12	8	9	4	13	3	2	5	6	1				58	52	22	8	7	3	132	18	132	18	132	18
Kinaesthesis																																					338	46
Sensations																																				288	39		
Muscular																																							
General								2					1			2	4		4	3		3	2	1				10	11	1	1	2	.1	22	3				
Shoulder														2															2			.3		2	.3				
Eye			1	7	2	2	4	7					2	2	1		2		1	1								14	14	4	2	2	.5	32	4				
Verbal				6	9	8	33	37	14					3	2						2		1					39	50	26	5	7	4	115	16				
Strain																																							
General									1				1	1	1				1			1	1	1				3	2	3	4	.3	4	8	1				
Head				6	7	1	18	6	1	1	2		6	8	3	6	4	3	1	3	3	2	2	1				40	32	12	5	4	2	84	11				
Forehead					1			1					2	2	1	2	3	1										4	7	2	.5	1	.3	13	2				
Eye					1		3	2	2				1	1				1		1								4	5	3	.5	.7	.4	12	2				
Images																																				50	7		
Verbal	1				2	1	18	17	6				1	2		1							1					21	22	7	3	3	1	50	7				
Aud. Verb.																																							
Total No. of Clearness Values per Phase	78	31	17	54	76	21	89	92	35	1	2		44	50	20	19	23	12	20	11	8	11	13	4				316	298	117									
Total for All Phases	126			151			216			3			114			54			39			28						731											
Percentages.	17			21			30			.4			16			7			5			4						43	41	16									
Total No. of Values in 3 Levels.	277						387															67																	
Percentages.	38						53															9																	

visual imaginal complexes, while Ru, who reported no visual sensations of less than degree 3, shows a slightly higher percentage of visual imagery than of sensational material. But no fixed relation as regards relative clearness of sensation and image of the kinaesthetic kind can be made out, possibly because these processes are all alike, - as some writers contend, - sensational in character. Again, no constant relation obtains between the clearness of sensations directly evoked and the frequency and clearness of those indirectly initiated. For example, C, whose visual processes range from 1 to 9 degrees in clearness, reveals a higher percentage of kinaesthesis, while Ru, who reported visual processes only as of the highest degrees, also possesses a much higher percentage (39) of kinaesthetic than of visual sensations (17). Neither is there apparent a direct relationship between the vividness of visual and of kinaesthetic sensations. In C's case, where the visual processes were widely distributed, kinaesthesis showed a tendency to run very low in clearness, whereas in the case of Ru, where the visual processes were concentrated at a high level, the kinaesthetic sensations were distributed, for the greater part, over the middle values. The directly and indirectly initiated sensations then seem to vary independently of each other both as to frequency and to clearness.

If, now, we consider all degrees of clearness under three large groups, maximally clear, moderately clear, and obscure, a grouping which our preliminary experiments seem to justify, then these wide irregularities in large measure disappear. The difference is revealed in Table XII which brings together the footings of the individual results (in Tables VIII - XI). The highest

TABLE XII.

Observers		Clearness Values 1	2	3	4	5	6	7	8	9	Totals for all Values — Phases. 1	2	3
C	Totals	7	54	70	57	34	59	96	106	71	198	215	141
De.			3	18	25	32	23	17	32	8	101	40	17
Ra.		30	67	38	29	23	23	13	4	1	112	99	17
Ru.		126	151	216	3	114	54	39	28		316	298	117
C	Percentage	1	10	13	10	6	11	17	19	13	36	39	25
De			2	11	16	20	15	11	20	5	64	25	11
Ra		13	29	16.6	13	10	10	6	2	4	49	43	8
Ru		17	21	30	4	16	7	5	4		43	41	16
	Grand Totals.	163	275	342	114	203	159	165	170	80	727	652	292
	Percentages	10	16	20	7	12	10	10	10	5	44	39	17
	Totals in 3 Levels	438		818				415					
	Percentages	26		49				25					

frequency (49%) falls within the field of moderate clearness, while the other regions are, in the totals, virtually the same (26% and 25%). All observers agree in the large number of processes of moderate clearness; though they differ in distribution to the two extremes of clarity and obscurity.

There is a change in the organization of perception not only when viewed in cross-section, but also when regarded in its temporal course. We recall from Experiment 1, that processes indirectly evoked compose almost exclusively every phase but the first. Furthermore, the results of Experiment 3 show that these indirectly initiated processes are generally less clear than the visual sensations, which, in a large measure, occupy the focus of attention. Thus the perception temporally undergoes a reorganization not only with respect to kind of process but also in regard to the degree of clarity of the various components. In the first phase are usually to be found only visual sensations, out of maximal clearness, while in the second there are, as a rule, accessory processes, but standing at a lower level of clearness. This fact seems to indicate a decrease in clearness from phase to phase of the perceptual complex. In Table XIII we have constructed a tabulation to show the relation of clearness between the processes of the first and second, and of the second and third phases of perception.

In order to maintain a constant standard, the changes were determined by the relation of the highest clearness values assigned in the two phases under comparison; e.g., if both the first and second phases possessed processes of the first degree, then they were considered as having undergone no change, but if

the first phase contained a process of degree 1, and the highest of the second phase was of degree 2, it was considered as a decrease in clearness. C. for instance, out of 88 perceptions reported 50 decreases in clearness between the first and second phases, 25 increases, and 13 wherein there were no changes. The symbols -, +, and 0 signify a decrease, increase, or no change, respectively.

Table XIII shows, then, that there is always a greater frequency of decreases in clearness than of increases or persistences. This observation indicates that perception undergoes a change in clearness from phase to phase, usually a decrease.

But the perceptual complex suffers not only with respect to clearness from phase to phase, but also in number of components. Inspection of the last three columns of Table XII will make it evident that, with the exception of C, every phase is less rich in processes than the one preceding. Thus perception declines in both clearness and in complexity of component members.

From this investigation we may draw the following conclusions:

1. The various areas of clearness within the perceptual complex, viewed in cross-section, differ as to the frequency of processes. The region of moderate clarity abounds in the greater number of components, while the areas of focal distinctness and obscurity each contribute but about half the number of the middle region to the perception. There were many more processes, however, in the obscure background which were wholly irrelevant to the perception, and have therefore not been included.

2. In perception, each large region of clearness also shows a predominance of some particular kind of process. The directly

evoked processes lie, for the greater part, within the area of maximal clearness, while those indirectly evoked are usually moderately clear, and less frequently obscure.

3. There is usually a gradual decrease in the clearness and frequency of the various processes from phase to phase.

Nevertheless, just as we found in Experiment 2, that although processes varied as to function, we could not say which component was of the most importance to the perception, so in this experiment, we cannot say whether processes with lower frequency but of greater clearness (directly evoked processes) are of more importance to the perception, or processes with a greater frequency and lower degree of clearness (indirectly evoked processes).

Table XIII.

Observers	1st to 2nd Phase: -	+	0	2nd to 3rd Phase -	+	0
C	50	25	13	29	19	6
De	27	7	4	8	6	1
Ra	29	13	9	8	2	1
Ru	53	6	30	26	16	17
Totals	159	51	56	71	43	25

D. A comparison of the primary and accessory processes in perception.

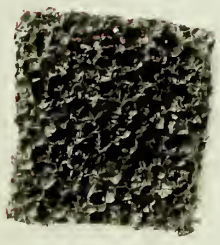
Problem and method. As a result of our experiments with objects possessing minimal or only slight significance, we have found that perceptions are composed of typical processes which display particular functions and which vary as to frequency and clearness. The processes may be divided into those

controlled or directly evoked, - in our case the light sensations, - and those indirectly initiated, the kinaesthetic, organic and imaginal processes. In this part of the investigation, we have attempted to determine the relative value of the controlled and uncontrolled processes to the perception of highly significant objects. For this purpose a series of fifty miniature objects[69] was prepared and attached to cards, in order that they might be exposed in

---

69. The series given in the order of presentation included cloves, piece of rubber sponge, match and match-box lid, pickle, bell, burned cigarette, velvet, ginger-snap, scales, whistle, date, Indian clubs, chain, wet chamois, cherry and leaf (artificial), tennis racket, bottle of green liquid, hammer, loaf sugar, lantern with red glass, thumb-tack, rubber ball, coffee grains, slice of lemon, cannon, violets, sand-paper, ball-bat, striped candy, telephone, sweet peas, fur, suit-case, orange peel, firecracker, red rose, ice, dumb-bell, half of English walnut, peanut, slice of onion, red hot wire (heated by electric current), key, chocolate candy, stamp, celery, thorny twig, screw, slice of apple, and pitcher.

the tachistoscope.



The objects were purposely chosen to call forth special imagery and kinaesthetic processes. We wished to find out whether the sensations, immediately initiated, imaginal processes, or processes connected with organic movement bear the chief importance in the perception. According to our purpose, some of the objects were chosen for the possible initiation of auditory imagery (as the bell and whistle), others, for kinaesthesis (as the Indian

clubs and hammer); others again (as the rose and sweet peas) to call out olfactory images. These objects were exposed for one second, and introspection was demanded for just the exposure period. The observers were Da, Ra, and Ru. The instructions were:

"Two seconds after a "ready" signal, an object will be briefly exposed. Observe the object carefully. Give a full introspective account of the (1) meanings, (2) processes, sensational and imaginal, reporting upon their clearness as 'very clear','moderately clear', or 'very obscure', and (3) temporal course of the perception."

Results. Table XIV gives the tabulation of the results of this experiment with respect to the frequency of the directly and indirectly initiated processes. P and C represent respectively peripheral and central processes. + and - indicate whether or not a process or complex was taken by the observer to add to the meaning of the perception.

If conclusions may be drawn upon the basis of frequency, we find that there is a tendency for indirectly controlled processes to increase in number as meaning becomes more elaborate,- a result which Experiment 2 also substantiated. In the case of objects of comparatively little meaning("slight") the indirect peripheral processes have a percentage of 49 (17 + 32); the direct, 27; and the indirect, central, 24 (15 + 9). But a comparison with the frequency of the same processes when meaning is more elaborate indicates in the latter an increase in centrally initiated processes. Under such conditions, the kinaesthetic and organic sensations are still the most frequent, composing approximately half of the total number (47%), but the imaginal components show a greater frequency (23 + 6%) than the visual sensations (24%). Thus there is an indication of elimination

TABLE XIV.

Observers		Meaning.									
		Slight					Considerable				
		Direct	Indirect.				Direct	Indirect.			
			P		C			P		C	
		+	+	−	+	−	+	+	−	+	−
Da	Totals	8	9	12	3	3	42	75	32	43	17
Ra		12	1	2	9	3	45	19	3	46	7
Ru		5	6	15	2	2	45	107	25	39	8
Da	Percentages	23	25	36	8	8	20	36	15	21	8
Ra		44	4	8	33	11	38	16	2	38	6
Ru		16	20	50	7	7	20	48	11	17	4
	Grand Totals	25	16	29	14	8	132	201	60	128	32
	Percentage	27	17	32	15	9	24	36	11	23	6

of processes connected with organic movement and of an increase of imaginal materials as cognitive elaboration develops.

If the importance of the various processes is estimated from a consideration of their relation to the development of the meaning, the indirectly evoked members of the perception again stand high. In the perceptions possessing slight significance, the percentage (41) of the indirectly initiated processes which failed to enlarge the purport exceeds that (32) of the same processes when they added to the meaning. But when we turn to the perceptions with much significance, there is an unexpected increase in the opposite direction: 59% enhanced significance, whereas but 17% failed to do so. These facts become all the more significant when we consider that irrespective of the relation of the indirectly evoked processes to the development of meaning, the directly initiated visual complexes represent but approximately the same percentage (27 and 24), whether meaning is slight or complex. This again supports the fact that accessory processes become of increasing importance to the perception.

When the indirect peripheral processes are compared with the indirect, central, the former seem to show a slightly higher value than the latter. These results, however, would be more conclusive if more observers had been employed in order to minimize or reduce individual variations. When meaning was slight, the percentage was approximately the same for both the kinaesthetic and organic sensations (17) and the imaginal materials (15), which augmented the significance of the perception. The positive peripheral processes, however, exceed the

imaginal by 13% in perceptions with much meaning. Nevertheless, there is an individual variation as to the importance of these two kinds of complexes. Two observers, Da and Ru, always show a predominance of indirect peripheral process (25 and 20%, 36 and 48%), which added to meaning, over the imaginal (8 and 7%, 21 and 17%), but Ra possesses a higher frequency of the positive centrally excited processes (33 and 38%) than of peripherally initiated (4 and 16%). Therefore, as far as our results go, whether the peripheral or central processes, indirectly excited, are of more importance to the meaning of perception depends upon the individual.

The relative importance of the various processes to the perception may be considered from another point of view, that of the relative clearness of the different processes. Table XV represents a tabulation made upon this basis.

An inspection of Table XV suggests[70] that most (22 and 20%) of the indirect peripheral processes occur at the moderately clear level, but they also show relatively high frequencies (compared to those of other processes) in the areas of maximal clarity and obscurity. The visual sensations present the highest frequency in the focus, while the imaginal processes are fairly well distributed throughout all three levels. Again, as with the results of the Table XIV, these generalizations must be

---

70. The symbols v, m, and o represent the various levels of clearness: very clear, moderately clear, and very obscure.

TABLE XV.

		MEANING																	
		SLIGHT									CONSIDERABLE.								
		DIRECT			INDIRECT.						DIRECT.			INDIRECT.					
					P			C						P			C		
OBSERVERS		V	M	O	V	M	O	V	M	O	V	M	O	V	M	O	V	M	O
DA	TOTALS.	7	1		9	6	6	1	3	2	30	12		38	43	26	10	19	31
RA		8	2	2	2		1	9		3	34	7	4	6	7	9	33	14	6
RU		5			1	14	16		3	1	43	2		12	63	57	6	29	12
DA	PERCENTAGE	20	3		36	17	17	3	8	6	14	6		18	21	12	5	9	15
RA		30	7	7	7		4	33		11	28	6	3	5	6	8	27	12	5
RU		17			3	47	20		10	3	19	.9		6	28	25	2	13	6
	GRAND TOTAL.	20	3	2	12	20	13	10	6	6	107	21	4	56	113	92	49	62	49
	PERCENTAGE	22	3	2	13	22	14	11	6	6	19	4	.7	10	20	17	9	11	9

considered in the light of the fact that there were but three observers and but one hundred and fifty perceptions, and that, therefore, averages tend to loose their significance under the influence of individual variations.

Let us consider now some of the variations indicated. These are most marked in regard to the accessory complexes. With respect to the organic and kinaesthetic processes, Da presents the greatest percentage among the maximally clear for the slight, but among the moderately clear for high significance; Ru, in the moderately clear region for both; while for Ra, who reported very few at all in perceptions with slight meanings, the peripheral accessory phenomena tend to drop into obscurity in perceptions with more cognitive elaboration. With respect to imagery, we find the same extensive variations. Ra, whose central accessory processes indicated a closer relation to the perception than the peripheral accessories, finds that the former are usually maximally clear as opposed to the obscurity of the latter. From this, we should expect to find that the centrally excited processes are more frequently found in the obscure regions of consciousness by Da and Ru. Da, having reported very few under the first class, shows almost equal distribution there, but in the second clase of perceptions, or those with much significance, she reports more as obscure than in both of the other levels together. For Ru, the imaginal processes came, for the greater part, within the region of moderate clearness.

The results of this investigation indicate then: (1) that

although the sensations directly initiated compose but approximately 25% of all processes, nevertheless they are of fundamental importance to perception, since they are generally the clearest factors, and always bear some positive relation to the development of the meaning; (2) that the relative values of the indirectly evoked processes depend primarily upon the observer, both in respect to enhancement of meaning and to the clearness of the various processes, - with, however, a predominance in favor of kinaesthetic and organic processes, when individual differences are eliminated.

But there is still another very important question related to the analysis of perception which arises and may be answered from these results, namely, the absolute necessity of organic movement for perception. Each O reported the analysis of fifty perceptual complexes during this investigation. Out of that number, Da reported 10% and Ra 30% which involved no kinaesthesis or organic complexes of any type, sensational or imaginal. Ru discovered some kind of bodily movement, general or localized, in every perception. But the fact that two observers introspectively found complexes in which no such factors were involved indicates that the processes are not an absolute necessity for perceiving an object. This conclusion is further substantiated by the results of Experiment 1, where 8% of the typical perceptual formations lacked kinaesthetic or organic factors. This percentage would be materially increased (11% for each S and V out of the total number of their integrations

listed in the 13 typical patterns) if individual variations were considered, rather than determining the percentage upon the basis of all perceptions for all observers. This would also be more just to actual facts, since we have seen from Experiment 4 that the incorporation of organic factors within perception is a matter of individual differences.[71]

SUMMARY AND CONCLUSIONS.

From the combined results of all our experiments, we may conclude that 'visual' perceptions tend, under our conditions, to present typical formations, which are composed of similar processes or members and are similarly organized or constituted. During the four experiments we have analyzed approximately 1500 perceptual complexes, all of which have revealed forms of integration the same as, or similar to, the standardized forms symbolized in Table III. We find the same component processes reported from perception to perception, whether the perception carries fragmentary, limited, or elaborate meaning. On the side of organization, again, our general results indicate no significant differences in the modes of integration of component parts of the complex (irrespective of changes of con-

---

71. The results of a minor problem (conducted by Miss Davis, one of our observers) with emphasis upon this particular phase of perception seem to further support our facts. Three of four observers have thus far reported 44, 21, and 4% of their perceptions without any organic factors.

dition, whether the observer was instructed to attend to composition alone or to composition and constitution). In the third place, we have found a gradual change in the function of the various accessory processes, which is expressed in the modification and particularly the expansion of meaning. This modification will be made evident by a review of Experiments 1, 2, and 4 (3 used the devices of 1), where there is a gradual evolution in complexity of the materials used. The functional modifications seem to follow a definite, temporal sequence; (1) in perceptions with very little meaning, the various accessory processes serve to interpret it, (2) in perceptions with more meaning, these processes not only interpret but also aid in localizing the object and a few may even be involved in appreciation, and (3) in perceptions with elaborate meanings, the localizing and especially the appreciative functions become more and more frequent. A fourth general conclusion may be made in regard to the relative value of the 'direct' and 'indirect' processes to the meaning of the perception. In all the experiments, we find a predominance of kinaesthetic and organic factors over visual sensations and imaginal processes. But in spite of the predominance of kinaesthesis in the total number of perceptions, in each investigation there were reported frequent perceptions which did not involve any form of organic movement. General results indicate, then, that, although organic movement is incorporated into most perceptual complexes, its frequent absence seems to show that objects may be perceived without any organic movement.

Our results agree in general with the views maintained by several writers, James, Bagley, Wallaschek, Lehmann, and Titchener,[72] that the background, sensational or imaginal, is of fundamental importance to the meaning of perception. The kinaesthetic and organic sensations and the imaginal processes under our conditions have consistently formed a 'setting' or 'halo' for the 'visual' focus, and have supplied more of derived significance than the 'directly' initiated processes themselves. But we would not go so far as to contend that this 'context' is the meaning,[73] since the process itself is always to be considered as distinct from its function. When meaning is described no single process or group of processes, focal or marginal, can be looked upon as the meaning of the whole complex, but we must consider all of the integrated members as a unit. When we consider that meaning presents stages of elaboration, - the lowest being the bare apprehension of object,- the directly evoked processes become of more importance to the significance in the lower stages than the 'fringe' or 'context'. This latter then functionates as a forced searching or seeking for derived, elaborate meaning, which usually fails. Nevertheless, as mean-

---

72. James, W., op.cit., I, 258; Bagley, W.C., The apperception of the spoken sentence; a study in the psychology of language, Amer. J. of Psychol., 1900, xii, 80; Wallaschek, R., Psychologie und Pathologie der Vorstellung, Leipzig, 1905, 188; Lehmann, A., Grundzüge der Psychophysiologie, Leipzig, 1912, 603; and Titchener, E. B., A textbook of psychology, N. Y., 1915, 367 ff.

73. Titchener, E. B., ibid., 367.

ing becomes more elaborate, the accessory processes acquire increasing importance. We may say with Bagley that the "margin and focus of consciousness play the one into the hand of the other."[74] We should further agree with James that the "difference between those [states of mind] that are mere 'acquaintance'" (our perceptions with minimal meaning), and "those that are 'knowledges-about" (our perceptions of maximal meaning) "is reducible almost entirely to the absence or presence of psychic fringes or overtones."[75]

Since we have contended for such an intimate relation between meaning and process, we cannot agree with the exponents of 'imageless' thought, that the two are separate processes. Moore,[76] who has attempted to prove the presupposition experimentally, by a comparison of reaction times, seems to have fallen into two gross errors, first, he has failed to take into account stages of elaboration of meaning, and secondly, he has assumed that, if imagery and meaning were synonymous, the imagery must refer to the stimulus itself. Only very elaborate, derived meanings are considered in his results, and as the introspections of our trained observers show that perceptions under such conditions are very complex, we feel justified in asserting that Moore left out of account the greater share of essential processes, which are introspectively observable. In regard

---

74. Op. cit., 129.
75. James, W., op. cit., I, 259.
76. Moore, T. V., The temporal relations of meaning and imagery, Psychol. Rev., 1915, xxii, 177.

to imagery, our own results show that the memory image of the stimulus, whether visual or kinaesthetic was much less frequent than images with derived meanings, all of which bore a direct relation to the total meaning. A comparison, then, of the reaction times of meaning and of imagery, directly referring to stimulus, would not be a fair determination of the relation of the meaning to imagery, since the greater share of imaginal processes have been disregarded. A qualified statement of this problem by Tolman[77] accords better with our own results, namely, that "meaning depends upon image but is itself distinct from the latter."

Our experimental results seem to justify the following generalizations:

1. 'Visual' perceptions present a number of typical formations, each of which presents its own peculiar mode of integration and is marked by a distinctive temporal course. These formations are variously based upon three kinds of mental processes, (1) visual sensations directly evoked by stimulus, (2) kinaesthetic and organic sensations indirectly evoked (peripheral accessories), and (3) imaginal materials drawn from various sources (central accessories).

2. All 'visual' perceptions have the same general constitution. The visual sensations, directly evoked by stimulus, are usually the clearest processes within the perceptual pattern,

---

77. Tolman, E. C., More concerning the temporal relations of meaning and imagery, Psychol. Rev., 1917, xxiv, 138.

while the accessory processes lie almost entirely in the region of moderate clearness. The obscure processes are, for the greater part, not relevant to the perception. During the temporal course of the perception, typical modifications occur; (1) there is a gradual decrease in the number and clearness of the processes from phase to phase, and (2) there is readjustment of the various factors themselves, the visual sensations tend toward obscurity, while the accessory processes become more prominent.

3. The component processes fulfill different functions according to the degree of cognitive elaboration. Where the meaning is minimal or slight (as in the bare apprehension of an irregular figure), the processes first bear the meaning and secondarily reinforce (in the form of effort or intent) a self-instruction to seek significance in the figure. Where the meaning is moderate or complex, beside the primary ascription of meaning, the accessory processes may either give a value to the object perceived (appreciative function) or set it in its spatial and temporal relations (localizing function).

4. Meaning is directly correlated with the number and degrees of clearness of the indirectly initiated process (peripheral and central accessories).

5. Organic movement is not an absolute necessity for perception.

VITA

The writer was born July 3, 1889, in Bushnell, Illinois. She graduated from the Bushnell High School in 1907, from the University of Illinois, with the A. B. degree, in 1911. During the years 1913-1914 she was a graduate student in Classics in the University of Illinois, receiving the A. M. degree in 1914. During the years 1914-1916 she was graduate assistant, and during the year 1916-1917, assistant in Psychology at the University of Illinois. Her graduate work has been pursued under the direct supervision of Professor Madison Bentley.